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(54) Title: CHEMICALLY-MODIFIED MYELOPOIETIN CONJUGATES

(57) Abstract: The present invention provides a chemically modified Myelopoietin (MPO) prepared by binding a water soluble polymer to the protein. The chemically-modified protein according to the present invention may have a much longer lasting neutrophil-increasing activity than that of the un-modified MPO, enabling reduced dose and scheduling opportunities.



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CHEMICALLY-MODIFIED MYELOPOIETIN CONJUGATES

The present application claims priority under Title 35,
5 United States Code, §119 of United States Provisional
application Serial No. 60/195,496 filed April 06, 2000.

FIELD OF THE INVENTION

10

The present invention relates to a chemical
modification of myelopoietins (MPOs), a family of
recombinant proteins, which are multifunctional
agonists of human interleukin-3 (IL-3) and another
15 hematopoietic growth factor receptor, including but not
limited to G-CSF, by which the chemical and/or
physiological properties of MPO can be changed. The
PEGylated MPOs may have a decreased clearance rate,
improved stability, decreased antigenicity, or a
20 combination thereof. The family of MPO proteins is
defined as the multifunctional agonists described in US
5,738,849, US 5,858,347, US 6,057,133, US 6,132,991, US
6,022,535, US 6,030,812, WO 95/21197 and WO 95/21256,
which are incorporated herein in their entirety. The
25 present invention also relates to processes for the
modification of MPO. In addition, the present invention
relates to pharmaceutical compositions comprising the
modified MPO. A further embodiment is the use of the
modified MPO to treat hematopoietic disorders.

30

BACKGROUND OF THE INVENTION

Myelopoietin may be useful in the treatment of
general haematopoietic disorders, including those
35 arising from chemotherapy or from radiation therapy

(Mac Vittie, T. J.; et al., *Exp. Hematol.* (1999), 27(10), 1557-1568). MPO may also be useful in bone marrow transplantation, wound healing, burn treatment, and the treatment of parasite, bacterial or viral
5 infection.

It is generally observed that physiologically active proteins administered into a body can show their pharmacological activity only for a short period due to their high clearance rate in the body. Furthermore, the
10 relative hydrophobicity of these proteins may limit their stability.

For the purpose of decreasing the clearance rate, improving stability or abolishing antigenicity of therapeutic proteins, some methods have been proposed
15 wherein the proteins are chemically modified with water-soluble polymers. Chemical modification of this type may block effectively a proteolytic enzyme from physical contact with the protein backbone itself, thus preventing degradation. Chemical attachment may
20 effectively reduce renal clearance. Additional advantages include, under certain circumstances, increasing the stability and circulation time of the therapeutic protein, increasing solubility, and decreasing immunogenicity. A review article describing
25 protein modification and fusion proteins is Francis, Focus on Growth Factors 3: 4-10 (May 1992) (published by Mediscript, Mountview Court, Friern Barnet Lane, London N20, OLD, UK).

Poly(alkylene oxide), notably poly(ethylene glycol) (PEG), is one such chemical moiety, which has
30 been used in the preparation of therapeutic protein products (the verb "pegylate" meaning to attach at least one PEG molecule). The attachment of poly(ethylene glycol) has been shown to protect against

proteolysis, Sada, *et al.*, *J. Fermentation Bioengineering* 71: 137-139 (1991), and methods for attachment of certain poly(ethylene glycol) moieties are available. See U.S. Pat. No. 4,179,337, Davis *et al.*, "Non-Immunogenic Polypeptides," issued Dec. 18, 1979; and U.S. Pat. No. 4,002,531, Royer, "Modifying enzymes with Polyethylene Glycol and Product Produced Thereby," issued Jan. 11, 1977. For a review, see Abuchowski *et al.*, in Enzymes as Drugs. (J. S. Holcerberg and J. Roberts, eds. pp. 367-383 (1981)).

Other water-soluble polymers have been used, such as copolymers of ethylene glycol/propylene glycol, carboxymethylcellulose, dextran, poly(vinyl alcohol), poly(vinyl pyrrolidone), poly(-1,3-dioxolane), poly(-1,3,6-trioxane), ethylene/maleic anhydride copolymer, poly- amino acids (either homopolymers or random copolymers).

A number of examples of pegylated therapeutic proteins have been described. ADAGEN®, a pegylated formulation of adenosine deaminase, is approved for treating severe combined immunodeficiency disease. ONCASPAR®, a pegylated L-asparaginase has been approved for treating hypersensitive ALL patients. Pegylated superoxide dismutase has been in clinical trials for treating head injury. Pegylated α -interferon (U.S. 5,738,846, 5,382,657) has been tested in phase III clinical trials for treating hepatitis with PEG-Intron (pegitron alfa-2b) approved for the treatment of chronic hepatitis C while another molecule, PEGASYS™, still awaits regulatory approval; pegylated glucocerebrosidase and pegylated hemoglobin are reported to have been in preclinical testing. Another example is pegylated IL-6, EF 0 442 724, entitled,

"Modified hIL-6," which discloses poly(ethylene glycol) molecules added to IL-6.

Another specific therapeutic protein, which has been chemically modified, is granulocyte colony
5 stimulating factor, (G-CSF). G-CSF induces the rapid proliferation and release of neutrophilic granulocytes to the blood stream, and thereby provides therapeutic effect in fighting infection. European patent
publication EP 0 401 384, published Dec. 12, 1990,
10 entitled, "Chemically Modified Granulocyte Colony Stimulating Factor," describes materials and methods for preparing G-CSF to which poly(ethylene glycol) molecules are attached. Modified G-CSF and analogs thereof are also reported in EP 0 473 268, published
15 Mar. 4, 1992, entitled "Continuous Release Pharmaceutical Compositions Comprising a Polypeptide Covalently Conjugated To A Water Soluble Polymer," stating the use of various G-CSF and derivatives covalently conjugated to a water soluble particle
20 polymer, such as poly(ethylene glycol). A modified polypeptide having human granulocyte colony stimulating factor activity is reported in EP 0 335 423 published Oct. 4, 1989. Provided in U.S. 5,824,784 are methods for N-terminally modifying proteins, including N-
25 terminally chemically modified G-CSF compositions. U.S. 5,824,778 discloses chemically modified G-CSF.

Japanese patent application Hei2 (1990)-30555 discloses chemically modified human IL-3 having decreased antigenicity.

30 The family of MPO proteins is disclosed in US 5,738,849, US 5,858,347, US 6,057,133, US 6,132,991, US 6,022,535, US 6,030,812, WO 95/21197, and WO 95/21256.

For poly(ethylene glycol), a variety of means has been used to attach the poly(ethylene glycol) molecules

to the protein. Generally, poly(ethylene glycol) molecules are connected to the protein via a reactive group found on the protein.

Amino groups, such as those on lysine residues or
5 at the N-terminus, are convenient for such attachment. For example, Royer (U.S. Pat. No. 4,002,531, above) states that reductive alkylation was used for attachment of poly(ethylene glycol) molecules to an enzyme. EP 0 539 167, published Apr. 28, 1993, Wright,
10 "Peg Imidates and Protein Derivatives Thereof" states that peptides and organic compounds with free amino group(s) are modified with an imidate derivative of PEG or related water-soluble organic polymers. Chamow *et al.*, *Bioconjugate Chem.* 5: 133-140 (1994) report the
15 modification of CD4 immunoadhesin with monomethoxypoly(ethylene glycol)aldehyde via reductive alkylation. The authors report that 50% of the CD4-Ig was MePEG-modified under conditions allowing control over the extent of pegylation. *Ibid.* at page 137. The
20 authors also report that the *in vitro* binding capability of the modified CD4-Ig (to the protein gp 120) decreased at a rate correlated to the extent of MePEGylation *Ibid.* U.S. Pat. No. 4,904,584, Shaw, issued Feb. 27, 1990, relates to the modification of
25 the number of lysine residues in proteins for the attachment of poly(ethylene glycol) molecules via reactive amine groups.

Many methods of attaching a polymer to a protein involve using a moiety to act as a linking group.
30 However, such moieties may be antigenic. A tresyl chloride method involving no linking group is available, but this method may be difficult to use to produce therapeutic products as the use of tresyl chloride may produce toxic by-products. See Francis *et*

al., In: Stability of protein pharmaceuticals: in vivo pathways of degradation and strategies for protein stabilization (Eds. Ahern, T. and Manning, M. C.) Plenum, New York, 1991) Also, Delgado et al., "Coupling of PEG to Protein By Activation With Tresyl Chloride, Applications In Immunoaffinity Cell Preparation", in Separations Using Aqueous Phase Systems, Applications In Cell Biology and Biotechnology, Fisher et al., eds. Plenum Press, New York, N.Y., 1989 pp. 211-213.

See also, Rose et al., *Bioconjugate Chemistry* 2: 154-159 (1991) which reports the selective attachment of the linker group carbonyldrazide to the C-terminal carboxyl group of a protein substrate (insulin).

The present invention provides chemically modified MPO molecules having decreased clearance rate, increased stability, decreased antigenicity, or combinations thereof.

SUMMARY OF THE INVENTION

The present invention relates to chemically modified MPOs, which have at least one improved chemical or physiological property selected from but not limited to decreased clearance rate, increased stability, and decreased antigenicity. Thus, as described below in more detail, the present invention has a number of aspects relating to chemically modifying MPOs as well as specific modifications using a variety of poly(ethylene glycol) moieties.

The present invention also relates to methods of producing the chemically modified MPOs.

The present invention also relates to compositions comprising the chemically modified MPOs.

The modified MPO of the present invention may be useful in the treatment of, but not limited to, neutropenia, thrombocytopenia, mobilization of hematopoietic progenitors and stem cells into
5 peripheral blood, bone marrow suppression or hematopoietic deficiencies, and immunodeficiencies.

BRIEF DESCRIPTION OF THE DRAWINGS

10 FIG. 1 is a reproduction of the ion-exchange chromatography elution profile of a 30,000 MW PEG-ALD MPO reaction.

FIG. 2 is an SDS-PAGE of 20,000 and 30000 MW PEG-ALD
15 MPO. Lane 1. MW Protein standards; Lane 2. MPO (10ug); Lane 3. 20,000 MW PEG-ALD MPO (10ug); Lane 4. 30,000 MW PEG-ALD MPO (10ug).

FIG. 3a is an SEC HPLC profile of recombinant MPO
20 30,000 NW PEG-ALD RX mix, ion exchange purified N-terminally mono-pegylated 30,000 MW PEG-ALD MPO, recombinant MPO 20,000 MW PEG-ALD RX mix, and ion exchange purified N-terminally mono-pegylated 20,000 MW PEG-ALD MPO.

25

FIG. 3b is an SEC HPLC profile of 10,000 MW branched PEG2-NHS MPO, 20,000 MW branched PEG2-NHS MPO, and 40,000 MW branched PEG2-NHS MPO.

30 FIG. 4 is reversed phase HPLC profile for 1. MPO; 2. N-terminally mono-PEGylated 20,000 MW PEG-ALD MPO; and 3. N-terminally mono-PEGylated 30,000 MW PEG-ALD MPO.

FIG. 5 shows a reversed phase HPLC tryptic maps for MPO, N-terminally mono-PEGylated 30,000 MW PEG-ALD MPO, and N-terminally mono-PEGylated 20,000 MW PEG-ALD MPO.

5 FIG. 6 illustrates a comparison of response curves for an IL3 receptor agonist, a G-CSF receptor agonist, co-addition of IL3 receptor agonist and a G-CSF receptor agonist, un-PEGylated MPO and mono-PEGylated PEG-ALD MPO in colony forming unit granulocyte/macrophage (CFU-
10 GM) assay which measures expansion and differentiation of a human bone marrow-derived CD34+ cells.

FIG. 7 compares the *in vivo* bioactivity of un-PEGylated and N-terminally mono-PEGylated PEG-ALD MPO by
15 illustrating the absolute neutrophil counts (ANC) during a period of 240 hours after a single subcutaneous injection dose in normal rhesus monkeys.

DETAILED DESCRIPTION OF THE INVENTION

20

Myelopoietin (MPO) proteins are members of a family of recombinant proteins, which are multifunctional agonists of human interleukin-3 (IL-3) and another hematopoietic growth factor. Their
25 recombinant production and methods of use are detailed in US 5,738,849, US 5,858,347, US 6,057,133, US 6,132,991, US 6,022,535, US 6,030,812, WO 95/21197 and WO 95/21256.

Any purified and isolated MPO, which is produced
30 by host cells such as *E. coli* and animal cells transformed or transfected by using recombinant genetic techniques, may be used in the present invention. Among them, MPO, which is produced by the transformed *E. coli*, is particularly preferable. Such MPO may be

obtained in large quantities with high purity and homogeneity. For example, the above MPO may be prepared according to a method disclosed in US 5,738,849, US 5,858,347, US 6,057,133, US 6,132,991, US 6,022,535, 5 and US 6,030,812. The term "substantially has the following amino acid sequence" means that the above amino acid sequence may include one or more amino-acid changes (deletion, addition, insertion or replacement) as long as such changes will not cause any 10 disadvantageous non-similarity in function to MPO. It is more preferable to use the MPO substantially having an amino acid sequence, in which at least one lysine, aspartic acid, glutamic acid, or unpaired cysteine residue is included.

15 According to the present invention, poly(ethylene glycol) is covalently bound through amino acid residues of MPO. The amino acid residue may be any reactive one(s) having, for example, free amino, carboxyl or sulfhydryl (thiol) groups, to which a terminal reactive 20 group of an activated poly(ethylene glycol) may be bound. The amino acid residues having the free amino groups may include lysine residues and/or N-terminal amino acid residue, those having a free carboxyl group may include aspartic acid, glutamic acid and/or C- 25 terminal amino acid residues, and having a sulfhydryl (thiol) such as cysteine.

In another embodiment, oxine chemistries (Lemieux & Bertozzi *Tib Tech* **16**:506-513, 1998) are used to target N-terminal serine residues.

30 The poly(ethylene glycol) used in the present invention is not restricted to any particular form or molecular weight range. Normally a molecular weight of 500-60,000 is used and preferably of from 1,000-40,000. The poly(ethylene glycol) can also be a branched PEG as

described in U.S. 5,932,462, U.S. 5,342,940, U.S. 5,643,575, U.S. 5,919,455, U.S. 6,113,906, and U.S. 5,183,660.

Poly(alkylene oxides), notably poly(ethylene glycol)s, are bound to MPO via a terminal reactive group, which may or may not leave a linking moiety (spacer) between the PEG and the protein. In order to form the MPO conjugates of the present invention, polymers such as poly(alkylene oxide) are converted into activated forms, as such term is known to those of ordinary skill in the art. The reactive group, for example, is a terminal reactive group, which mediates a bond between chemical moieties on the protein, such as amino, carboxyl or thiol groups, and poly(ethylene glycol). Typically, one or both of the terminal polymer hydroxyl end-groups, (i.e. the alpha and omega terminal hydroxyl groups) are converted into reactive functional groups, which allows covalent conjugation. This process is frequently referred to as "activation" and the poly(ethylene glycol) product having the reactive group is hereinafter referred to as "an activated poly(ethylene glycol)". Polymers containing both α and ω linking groups are referred to as "bis-activated poly(alkylene oxides)" and are referred to as "bifunctional". Polymers containing the same reactive group on α and ω terminal hydroxyls are sometimes referred to as "homobifunctional" or "homobis-activated". Polymers containing different reactive groups on α and ω terminal hydroxyls are sometimes referred to as "heterobifunctional" or "heterobis-activated". Polymers containing a single reactive group are referred to as "mono-activated" polyalkylene oxides or "mono-functional". Other substantially non-

antigenic polymers are similarly "activated" or "functionalized".

The activated polymers are thus suitable for mediating a bond between chemical moieties on the protein, such as α -amino, carboxyl or thiol groups, and poly(ethylene glycol). Bis-activated polymers can react in this manner with two protein molecules or one protein molecule and a reactive small molecule in another embodiment to effectively form protein polymers or protein-small molecule conjugates through cross linkages. Functional groups capable of reacting with either the amino terminal α -amino group or ϵ -amino groups of lysines found on the MPO include: carbonates such as the p-nitrophenyl, or succinimidyl; carbonyl imidazole; azlactones; cyclic imide thiones; isocyanates or isothiocyanates and aldehydes. Functional groups capable of reacting with carboxylic acid groups, reactive carbonyl groups and oxidized carbohydrate moieties on MPO include; primary amines; and hydrazine and hydrazide functional groups such as the acyl hydrazides, carbazates, semicarbamates, thiocarbazates, etc. Mercapto groups, if available on the MPO, can also be used as attachment sites for suitably activated polymers with reactive groups such as thiols; maleimides, sulfones, and phenyl glyoxals; see, for example, U.S. Pat. No. 5,093,531, the disclosure of which is hereby incorporated by reference. Other nucleophiles capable of reacting with an electrophilic center include, but are not limited to, for example, hydroxyl, amino, carboxyl, thiol, active methylene and the like.

In one preferred embodiment of the invention secondary amine or amide linkages are formed using the MPO N-terminal amino groups or ϵ -amino groups of lysine

and the activated PEG. In another preferred aspect of the invention, a secondary amine linkage is formed between the N-terminal primary amino group of MPO and single or branched chain PEG aldehyde by reduction with
5 a suitable reducing agent such as NaCNBH₃, NaBH₃, Pyridine Borane etc. as described in Chamow *et al.*, *Bioconjugate Chem.* 5: 133-140 (1994) and US Pat. No 5,824,784.

In another preferred embodiment of the invention,
10 polymers activated with amide-forming linkers such as succinimidyl esters, cyclic imide thiones, or the like are used to effect the linkage between the MPO and polymer, see for example, U.S. Pat. No. 5,349,001; U.S. Pat. No. 5,405,877; and Greenwald, *et al.*, *Crit. Rev.*
15 *Ther. Drug Carrier Syst.* **17**:101-161, 2000, which are incorporated herein by reference. One preferred activated poly(ethylene glycol), which may be bound to the free amino groups of MPO includes single or branched chain N-hydroxysuccinylimide poly(ethylene
20 glycol) may be prepared by activating succinic acid esters of poly(ethylene glycol) with N-hydroxysuccinylimide.

Other preferred embodiments of the invention include using other activated polymers to form covalent
25 linkages of the polymer with the MPO via ϵ -amino or other groups. For example, isocyanate or isothiocyanate forms of terminally activated polymers can be used to form urea or thiourea-based linkages with the lysine amino groups.

30 In another preferred aspect of the invention, carbamate (urethane) linkages are formed with protein amino groups as described in U.S. Pat. Nos. 5,122,614, 5,324,844, and 5,612,640, which are hereby incorporated by reference. Examples include N-succinimidyl

carbonate, para-nitrophenyl carbonate, and carbonyl imidazole activated polymers. In another preferred embodiment of this invention, a benzotriazole carbonate derivative of PEG is linked to amino groups on MPO.

5 Another aspect of the invention represents a prodrug or sustained release form of MPO, comprised of a water soluble polymer, such as poly(ethylene glycol), attached to an MPO molecule by a functional linker that can predictably break down by enzymatic or pH directed
10 hydrolysis to release free MPO or other MPO derivative. The prodrug can also be a "double prodrug" (Bundgaard in *Advanced Drug Delivery Reviews* **3**:39-65, 1989) involving the use of a cascade latentiation. In such systems, the hydrolytic reaction involves an initial
15 rate-limiting (slow) enzymatic or pH directed step and a second step involving a rapid non-enzymatic hydrolysis that occurs only after the first has taken place. Such a releasable polymer provides protein conjugates, which are impermanent and could act as a
20 reservoir, that continually discharge MPO. Such functional linkers are described in US 5,614,549; US 5,840,900; US 5,880,131; US 5,965,119; US 6,011,042; US 6,180,095 B1; Greenwald R.B. et al., *J. Med. Chem.* **42**:3657-3667, 1999; Lee, S. et al., *Bioconjugate Chem*
25 **12**:163-169, 2001; Garman A.J. et al., *FEBS Lett.* **223**:361-365, 1987; Woghiren C. et al., *Bioconjugate Chem.* **4**:314-318, 1993; Roberts M.J. et al., *J. Pharm. Sci.* **87**:1440-1445, 1998; Zhao X., in *Ninth Int. Symp. Recent Adv. Drug Delivery Syst.* 199; Greenwald R.B. et
30 al., *J. Med. Chem.* **43**:475-487, 2000; and Greenwald R.B. *Crit. Rev. Ther. Drug Carrier Syst.* **17**:101-161, 2000.

Conjugation reactions, referred to as pegylation reactions, were historically carried out in solution

with molar excess of polymer and without regard to where the polymer will attach to the protein. Such general techniques, however, have typically been proven inadequate for conjugating bioactive proteins to non-
5 antigenic polymers while retaining sufficient bioactivity. One way to maintain the MPO bioactivity is to substantially avoid the conjugation of those MPO reactive groups associated with the receptor binding site(s) in the polymer coupling process. Another aspect
10 of the present invention is to provide a process of conjugating poly(ethylene glycol) to MPO maintaining high levels of retained activity.

The chemical modification through a covalent bond may be performed under any suitable condition generally
15 adopted in a reaction of a biologically active substance with the activated poly(ethylene glycol). The conjugation reaction is carried out under relatively mild conditions to avoid inactivating the MPO. Mild conditions include maintaining the pH of the reaction
20 solution in the range of 3 to 10 and the reaction temperatures within the range of from about 0°-37°C. In the cases where the reactive amino acid residues in MPO have free amino groups, the above modification is preferably carried out in a non-limiting list of
25 suitable buffers (pH 3 to 10), including phosphate, citrate, acetate, succinate or HEPES, for 1-48 hrs at 4°-37°C. In targeting N-terminal amino groups with reagents such as PEG aldehydes pH 4-7 is preferably maintained. The activated poly(ethylene glycol) may be
30 used in 0.05-100 times, preferably 0.05-0.5 times, the molar amount of the number of free amino groups of MPO. On the other hand, where reactive amino acid residues in MPO have the free carboxyl groups, the above modification is preferably carried out in pH from about

3.5 to about 5.5, for example, the modification with poly(oxyethylenediamine) is carried out in the presence of carbodiimide (pH 4-5) for 1-24 hrs at 4°-37°C. The activated poly(ethylene glycol) may be used in 0.05-300
5 times the molar amount of the number of free carboxyl groups of MPO.

In separate embodiments, the upper limit for the amount of polymer included in the conjugation reactions exceeds about 1:1 to the extent that it is possible to
10 react the activated polymer and MPO without forming a substantial amount of high molecular weight species, *i.e.* more than about 20% of the conjugates containing more than about one strand of polymer per molecule of MPO. For example, it is contemplated in this aspect of
15 the invention that ratios of up to about 6:1 can be employed to form significant amounts of the desired conjugates which can thereafter be isolated from any high molecular weight species.

In another aspect of this invention,
20 bifunctionally activated PEG derivatives may be used to generate polymeric MPO-PEG molecules in which multiple MPO molecules are crosslinked via PEG. Although the reaction conditions described herein can result in significant amounts of unmodified MPO, the unmodified
25 MPO can be readily recycled into future batches for additional conjugation reactions. The processes of the present invention generate surprisingly very little, *i.e.* less than about 30% and more preferably, less than about 10%, of high molecular weight species and species
30 containing more than one polymer strand per MPO. These reaction conditions are to be contrasted with those typically used for polymeric conjugation reactions wherein the activated polymer is present in several-fold molar excesses with respect to the target. In

other aspects of the invention, the polymer is present in amounts of from about 0.1 to about 50 equivalents per equivalent of MPO. In other aspects of the invention, the polymer is present in amounts of from
5 about 1 to about 10 equivalents per equivalent of MPO.

The conjugation reactions of the present invention initially provide a reaction mixture or pool containing mono- and di-PEG-MPO conjugates, unreacted MPO, unreacted polymer and usually less than about 20% high
10 molecular weight species. The high molecular weight species include conjugates containing more than one polymer strand and/or polymerized PEG-MPO species. After the unreacted species and high molecular weight species have been removed, compositions containing
15 primarily mono- and di-polymer-MPO conjugates are recovered. Given the fact that the conjugates for the most part include a single polymer strand, the conjugates are substantially homogeneous. These modified MPOs have at least about 5% of the *in vitro*
20 biological activity associated with the native or unmodified MPO as measured using standard cell proliferation assays, such as AML, TF1 and colony forming unit assays (U.S. Patent 6,030,812 which is incorporated by reference herein). In preferred aspects
25 of the invention, however, the modified MPOs have about 25% of the *in vitro* biological activity, more preferably, the modified MPOs have about 50% of the *in vitro* biological activity, more preferably, the modified MPOs have about 75% of the *in vitro* biological
30 activity, and most preferably the modified MPOs have equivalent or improved *in vitro* biological activity.

The processes of the present invention preferably include rather limited ratios of polymer to MPO. Thus, the MPO conjugates have been found to be predominantly

limited to species containing only one strand of polymer. Furthermore, the attachment of the polymer to the MPO reactive groups is substantially less random than when higher molar excesses of polymer linker are used. The unmodified MPO present in the reaction pool, after the conjugation reaction has been quenched, can be recycled into future reactions using ion exchange or size exclusion chromatography or similar separation techniques.

10 A poly(ethylene glycol)-modified MPO, namely chemically modified protein according to the present invention, may be purified from a reaction mixture by conventional methods which are used for purification of proteins, such as dialysis, salting-out, ultrafiltration, ion-exchange chromatography, gel chromatography and electrophoresis. Ion-exchange chromatography is particularly effective in removing unreacted poly(ethylene glycol) and MPO. In a further embodiment of the invention, the mono- and di-polymer-MPO species are isolated from the reaction mixture to remove high molecular weight species, and unmodified MPO. Separation is effected by placing the mixed species in a buffer solution containing from about 0.5-10 mg/mL of the MPO-polymer conjugates. Suitable solutions have a pH from about 4 to about 10. The solutions preferably contain one or more buffer salts selected from KCl, NaCl, K_2HPO_4 , KH_2PO_4 , Na_2HPO_4 , NaH_2PO_4 , $NaHCO_3$, $NaBO_4$, CH_3CO_2H , and NaOH.

30 Depending upon the reaction buffer, the MPO polymer conjugate solution may first have to undergo buffer exchange/ultrafiltration to remove any unreacted polymer. For example, the PEG-MPO conjugate solution can be ultrafiltered across a low molecular weight cut-off (10,000 to 30,000 Dalton) membrane to remove most

unwanted materials such as unreacted polymer, surfactants, if present, or the like.

The fractionation of the conjugates into a pool containing the desired species is preferably carried out using an ion exchange chromatography medium. Such media are capable of selectively binding PEG-MPO conjugates via differences in charge, which vary in a somewhat predictable fashion. For example, the surface charge of MPO is determined by the number of available charged groups on the surface of the protein. These charged groups typically serve as the point of potential attachment of poly(alkylene oxide) conjugates. Therefore, MPO conjugates will have a different charge from the other species to allow selective isolation.

Strongly polar anion or cation exchange resins such as quaternary amine or sulfopropyl resins, respectively, are used for the method of the present invention. Cation exchange resins are especially preferred. A non-limiting list of included commercially available cation exchange resins suitable for use with the present invention are SP-hitrap®, SP Sepharose HP® and SP Sepharose® fast flow. Other suitable cation exchange resins e.g. S and CM resins can also be used. A non-limiting list of anion exchange resins, including commercially available anion exchange resins, suitable for use with the present invention are Q-hitrap®, Q Sepharose HP®, and Q sepharose® fast flow. Other suitable anion exchange resins, e.g. DEAE resins, can also be used.

For example, the cation exchange resin is preferably packed in a column and equilibrated by conventional means. A buffer having the same pH and osmolality as the polymer conjugated MPO solution is

used. The elution buffer preferably contains one or more salts selected from KCl, NaCl, K_2HPO_4 , KH_2PO_4 , Na_2HPO_4 , NaH_2PO_4 , $NaHCO_3$, $NaBO_4$, and $(NH_4)_2CO_3$. The conjugate-containing solution is then adsorbed onto the column with unreacted polymer and some high molecular weight species not being retained. At the completion of the loading, a gradient flow of an elution buffer with increasing salt concentrations is applied to the column to elute the desired fraction of polyalkylene oxide-conjugated MPO. The eluted pooled fractions are preferably limited to uniform polymer conjugates after the cation exchange separation step. Any unconjugated MPO species can then be back washed from the column by conventional techniques. If desired, mono and multiply pegylated MPO species can be further separated from each other via additional ion exchange chromatography or size exclusion chromatography.

Techniques utilizing multiple isocratic steps of increasing concentration can also be used. Multiple isocratic elution steps of increasing concentration will result in the sequential elution of di- and then mono-MPO-polymer conjugates.

The temperature range for elution is between about 4°C and about 25°C. Preferably, elution is carried out at a temperature of from about 6°C to about 22°C. For example, the elution of the PEG-MPO fraction is detected by UV absorbance at 280 nm. Fraction collection may be achieved through simple time elution profiles.

A surfactant can be used in the processes of conjugating the poly(ethylene glycol) polymer with the MPO moiety. Suitable surfactants include ionic-type agents such as sodium dodecyl sulfate (SDS). Other ionic surfactants such as lithium dodecyl sulfate,

quaternary ammonium compounds, taurocholic acid, caprylic acid, decane sulfonic acid, etc. can also be used. Non-ionic surfactants can also be used. For example, materials such as poly(oxyethylene) sorbitans (Tweens), poly(oxyethylene) ethers (Tritons) can be used. See also Neugebauer, A Guide to the Properties and Uses of Detergents in Biology and Biochemistry (1992) Calbiochem Corp. The only limitations on the surfactants used in the processes of the invention are that they are used under conditions and at concentrations that do not cause substantial irreversible denaturation of the MPO and do not completely inhibit polymer conjugation. The surfactants are present in the reaction mixtures in amounts from about 0.01-0.5%; preferably from 0.05-0.5%; and most preferably from about 0.075-0.25%. Mixtures of the surfactants are also contemplated.

It is thought that the surfactants provide a temporary, reversible protecting system during the polymer conjugation process. Surfactants have been shown to be effective in selectively discouraging polymer conjugation while allowing lysine-based or amino terminal-based conjugation to proceed.

The present poly(ethylene glycol)-modified MPO has a more enduring pharmacological effect, which may be possibly attributed to its prolonged half-life *in vivo*. Furthermore, it is observed that the present poly(ethylene glycol)-modified MPO may accelerate recovery from neutropenia.

The present poly(ethylene glycol)-modified MPO may have essentially the same biological activity as an intact MPO and may accordingly be used in the same applications. The poly(ethylene glycol)-modified MPO has an activity for increasing the number of

neutrophils, and it is useful therefore in the treatment of general hematopoietic disorders including those arising from chemotherapy or from radiation therapy. It may be also useful in the treatment of
5 infection and in bone marrow transplantation. The modified MPO of the present invention may be useful in the treatment of diseases characterized by decreased levels of either myeloid, erythroid, lymphoid, or megakaryocyte cells of the hematopoietic system or
10 combinations thereof. In addition, they may be used to activate mature myeloid and/or lymphoid cells. Among conditions susceptible to treatment with the polypeptides of the present invention is leukopenia, a reduction in the number of circulating leukocytes
15 (white cells) in the peripheral blood. Leukopenia may be induced by exposure to certain viruses or to radiation. It is often a side effect of various forms of cancer therapy, e.g., exposure to chemotherapeutic drugs, radiation and of infection or hemorrhage.
20 Therapeutic treatment of leukopenia with these modified MPO of the present invention may avoid undesirable side effects caused by treatment with presently available drugs.

The modified MPO of the present invention may be
25 useful in the treatment or prevention of neutropenia and, for example, in the treatment of such conditions as aplastic anemia, cyclic neutropenia, idiopathic neutropenia, Chediak-Higashi syndrome, systemic lupus erythematosus (SLE), leukemia, myelodysplastic syndrome
30 and myelofibrosis.

The modified MPO of the present invention may be useful in the treatment or prevention of thrombocytopenia. Currently the only therapies for thrombocytopenia are platelet transfusions, which are

costly and carry the significant risks of infection (HIV, HBV) and alloimmunization, and IL-11 (Neumega™), which is approved for certain thrombocytopenia. The modified MPO may alleviate or diminish the need for platelet transfusions. Severe thrombocytopenia may result from genetic defects such as Fanconi's Anemia, Wiscott-Aldrich, or May-Hegglin syndromes. Acquired thrombocytopenia may result from auto- or allo-antibodies as in Immune Thrombocytopenia Purpura, Systemic Lupus Erythematosus, hemolytic anemia, or fetal maternal incompatibility. In addition, splenomegaly, disseminated intravascular coagulation, thrombotic thrombocytopenic purpura, infection, or prosthetic heart valves may result in thrombocytopenia. Severe thrombocytopenia may also result from chemotherapy and/or radiation therapy or cancer. Thrombocytopenia may also result from marrow invasion by carcinoma, lymphoma, leukemia, or fibrosis.

The modified MPO of the present invention may be useful in the mobilization of hematopoietic progenitors and stem cells into peripheral blood. Peripheral blood derived progenitors have been shown to be effective in reconstituting patients in the setting of autologous marrow transplantation. Hematopoietic growth factors including G-CSF and GM-CSF have been shown to enhance the number of circulating progenitors and stem cells in the peripheral blood. This has simplified the procedure for peripheral stem cell collection and dramatically decreased the cost of the procedure by decreasing the number of phereses required. The modified MPO may be useful in mobilization of stem cells and further enhance the efficacy of peripheral stem cell transplantation.

Another projected clinical use of growth factors

has been in the *in vitro* activation of hematopoietic progenitors and stem cells for gene therapy. In order to have the gene of interest incorporated into the genome of the hematopoietic progenitor or stem cell one
5 needs to stimulate cell division and DNA replication. Hematopoietic stem cells cycle at a very low frequency, which means that growth factors may be useful to promote gene transduction and thereby enhance the clinical prospects for gene therapy.

10 Many drugs may cause bone marrow suppression or hematopoietic deficiencies. Examples of such drugs are AZT, DDI, alkylating agents and anti-metabolites used in chemotherapy, antibiotics such as chloramphenicol, penicillin, gancyclovir, daunomycin and sulfa drugs,
15 phenothiazones, tranquilizers such as meprobamate, analgesics such as aminopyrine and dipyrone, anti-convulsants such as phenytoin or carbamazepine, antithyroids such as propylthiouracil and methimazole and diuretics. The modified MPO of the present
20 invention may be useful in preventing or treating the bone marrow suppression or hematopoietic deficiencies, which often occur in patients treated with these drugs.

Hematopoietic deficiencies may also occur because of viral, microbial, or parasitic infections and as a
25 result of treatment for renal disease or renal failure, e.g., dialysis. The modified MPO of the present invention may be useful in treating such hematopoietic deficiency.

The treatment of hematopoietic deficiency may
30 include administration of a pharmaceutical composition containing the modified MPO to a patient. The modified MPO of the present invention may also be useful for the activation and amplification of hematopoietic precursor cells by treating these cells *in vitro* with the

modified MPO of the present invention prior to injecting the cells into a patient.

Various immunodeficiencies e.g., in T and/or B lymphocytes, or immune disorders, e.g., rheumatoid arthritis, may also be beneficially affected by treatment with the modified MPO of the present invention. Immunodeficiencies may be the result of viral infections e.g. HTLV-I, HTLV-II, HTLV-III, severe exposure to radiation, cancer therapy or the result of other medical treatment. The modified MPO of the present invention may also be employed, alone or in combination with other hematopoietins, in the treatment of other blood cell deficiencies, including thrombocytopenia (platelet deficiency), or anemia. Other uses for these novel polypeptides are in the treatment of patients recovering from bone marrow transplants *in vivo* and *ex vivo*, and in the development of monoclonal and polyclonal antibodies generated by standard methods for diagnostic or therapeutic use.

The present poly(ethylene glycol)-modified MPO may be formulated into pharmaceuticals containing also a pharmaceutically acceptable diluent, an agent for preparing an isotonic solution, a pH-conditioner and the like in order to administer them into a patient. The above pharmaceuticals may be administered subcutaneously, intramuscularly, intravenously, or orally, depending on a purpose of treatment. A dose may be also based on the kind and condition of the disorder of a patient to be treated, being normally between 0.1 mg and 50 mg by injection and between 0.1 mg and 5 g in an oral administration for an adult

The polymeric substances included are also preferably water-soluble at room temperature. A non-limiting list of such polymers include poly(alkylene

oxide) homopolymers such as poly(ethylene glycol) or poly(propylene glycols), poly(oxyethylenated polyols), copolymers thereof and block copolymers thereof, provided that the water solubility of the block
5 copolymers is maintained.

As an alternative to PEG-based polymers, effectively non-antigenic materials such as dextran, poly(vinyl pyrrolidones), poly(acrylamides), poly(vinyl alcohols), carbohydrate-based polymers, and the like
10 can be used. Indeed, the activation of α - and ω -terminal groups of these polymeric substances can be effected in fashions similar to that used to convert poly(alkylene oxides) and thus will be apparent to those of ordinary skill. Those of ordinary skill in the
15 art will realize that the foregoing list is merely illustrative and that all polymer materials having the qualities described herein are contemplated. For purposes of the present invention, "effectively non-antigenic" means all materials understood in the art as
20 being nontoxic and not eliciting an appreciable immunogenic response in mammals.

Definitions

25 The following is a list of abbreviations and the corresponding meanings as used interchangeably herein:

	g	gram(s)
	mg	milligram(s)
	ml or mL	milliliter(s)
30	RT	room temperature
	PEG	poly (ethylene glycol)

The complete content of all publications, patents, and patent applications cited in this disclosure are

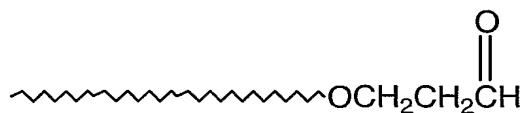
herein incorporated by reference as if each individual publication, patent, or patent application were specifically and individually indicated to be incorporated by reference.

5 Although the foregoing invention has been
described in some detail by way of illustration and
example for the purposes of clarity of understanding,
it will be readily apparent to one skilled in the art
in light of the teachings of this invention that
10 changes and modifications can be made without departing
from the spirit and scope of the present invention. The
following examples are provided for exemplification
purposes only and are not intended to limit the scope
of the invention, which has been described in broad
15 terms above.

In the following examples, the MPO polypeptide is that of residues 2-322 of SEQ ID NO:224. It is understood that other members of the MPO family of polypeptides could also be pegylated in a similar manner as exemplified in the subsequent examples.

EXAMPLE 1

Straight Chain 30,000 MW PEG-ALD MPO



M-PEG-Aldehyde 5,000, 20,000 and 30,000 MW

This example demonstrates a method for generation of substantially homogeneous preparations of N-terminally monopegylated MPO by reductive alkylation. Methoxy-
30 linear PEG-propionaldehyde reagent of approximately 30,000 MW (Shearwater Polymers Inc.) was selectively

coupled via reductive amination to the N-terminus of MPO by taking advantage of the difference in the relative pK_a value of the primary amine at the N-terminus versus pK_a values of primary amines at the ϵ -amino position of lysine residues.

MPO protein dissolved at 4.5 mg/mL in 10-20 mM sodium acetate, pH 4.5, was reacted with Methoxy-PEG-propionaldehyde (M-PEG-ALD) by addition of solid M-PEG-ALD to yield a relative PEG:Myelopoietin molar ratio of 6.5:1. Reactions were catalyzed by addition of stock 1M $NaCNBH_4$ dissolved in H_2O to a final concentration of 20 mM. Reactions were carried out at 4°C for 18-96 hours. Reactions were stopped by lowering the pH to 4.0 with 0.1 N acetic acid or by adding a 5X molar excess of Tris HCl.

EXAMPLE 2

Straight Chain 20,000 MW PEG-ALD MPO

Methoxy-linear 20,000 MW PEG-propionaldehyde reagent (Shearwater Polymers Inc.) was coupled to the N-terminus of MPO using the procedure described for Example 1.

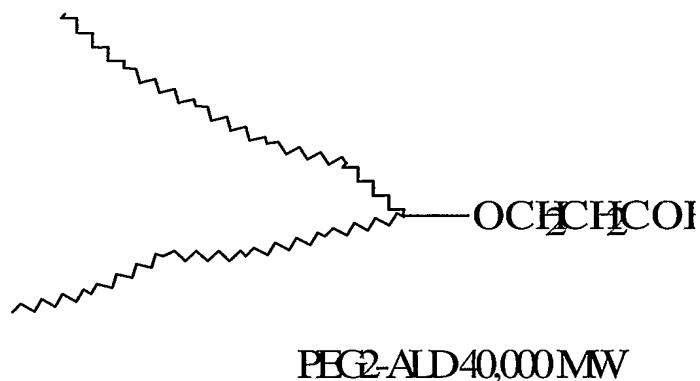
EXAMPLE 3

Straight chain 5,000 MW PEG-ALD MPO

Methoxy-linear 5,000 MW PEG-propionaldehyde reagent (Fluka) was coupled to the N-terminus of MPO using the procedure described for Example 1.

EXAMPLE 4

Branched chain 40,000 MW PEG2-ALD MPO



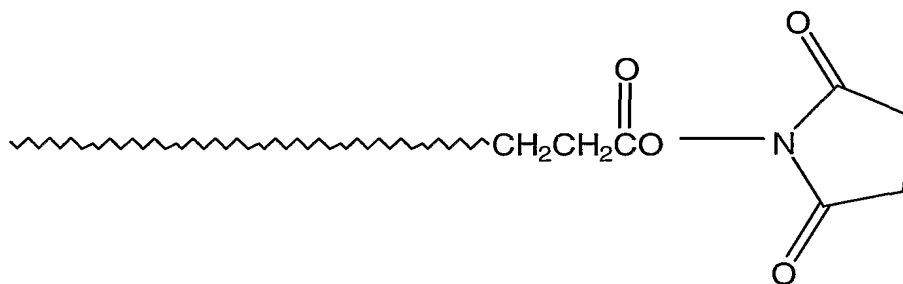
5

Methoxy-branched 40,000 MW PEG-propionaldehyde (PEG2-ALD) reagent (Shearwater Polymers Inc.) was coupled to the N-terminus of MPO using the procedure described for Example 1.

10

EXAMPLE 5

Straight chain 20,000 MW PEG-SPA MPO



15

This example demonstrates a method for generation of substantially homogeneous preparations of monopegylated Myelopietin (MPO) using N-hydroxysuccinimidyl (NHS) active esters. MPO protein stock solution dissolved at

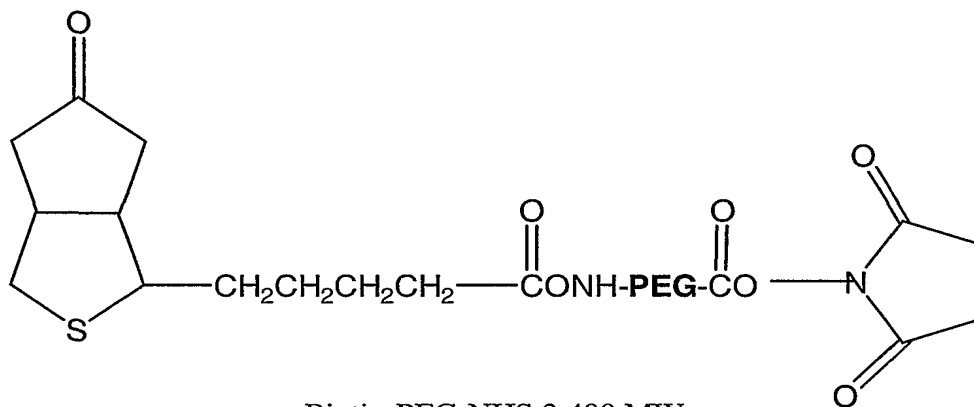
20

4.5 mg/mL in 10-20 mM sodium acetate, pH 4.5 was
 titrated to pH 7.2 by addition of 0.25 M HEPES buffer.
 The solution was then reacted with Methoxy-PEG-
 succinimidyl propionate (SPA-PEG) by addition of solid
 5 SPA-PEG to yield a relative PEG:Myelopoietin molar
 ratio of 6.5:1. Reactions were carried out at 4°C for 1
 hour. Reactions were stopped by lowering the pH to 4.0
 with 0.1 N acetic acid or by adding a 5X molar excess
 of Tris HCl.

10

EXAMPLE 6

Straight chain 3,400 MW Biotin-PEG-NHS MPO



15

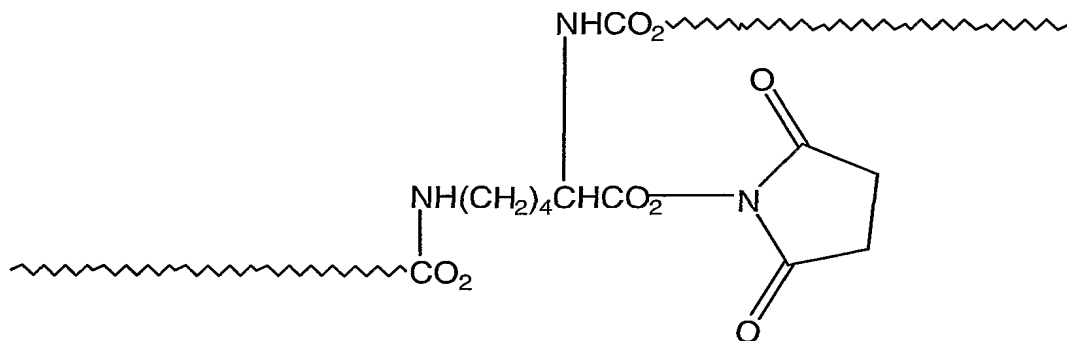
Biotin-PEG-NHS 3,400 MW

3,400 MW Biotin-PEG-CO₂-NHS reagent (Shearwater Polymers
 Inc.) was coupled to MPO using the procedure described
 for Example 5.

20

EXAMPLE 7

Branched 10,000 MW PEG2-NHS MPO



PEG2-NHS 10,000, 20,000 and 40,000 MW

10,000 MW branched PEG2-NHS (Shearwater Polymers Inc.)
 was coupled to MPO using the procedure described for
 5 Example 5.

EXAMPLE 8

Branched 20,000 MW PEG2-NHS MPO
 10

20,000 MW branched PEG2-SPA (Shearwater Polymers Inc.)
 was coupled to MPO using the procedure described for
 Example 5.

15 EXAMPLE 9

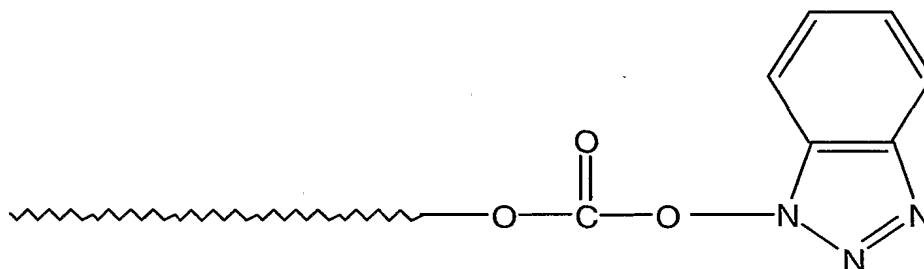
Branched 40,000 MW PEG2-NHS MPO

40,000 MW branched PEG2-NHS (Shearwater Polymers Inc.)
 20 was coupled to MPO using the procedure described for
 Example 5.

EXAMPLE 10

25

Straight chain 20,000 MW PEG-BTC MPO



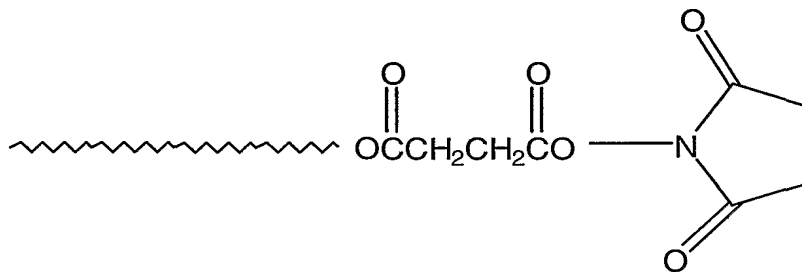
PEG-BTC 20,000 MW

20,000 MW PEG-BTC (Shearwater Polymers Inc.) was
 5 coupled to MPO using the procedure described for
 Example 4. This example demonstrates a method for
 generation of substantially homogeneous preparations of
 pegylated Myelopietin (MPO) using benzotriazole
 carbonate derivatives of PEG.

10

EXAMPLE 11

Straight chain 5,000 MW PEG-SS MPO



15

PEG-SS 5,000 MW

5,000 MW succinimidyl succinate-PEG (PEG-SS) (Shearwater
 Polymers Inc.) was coupled to MPO using the procedure
 described for Example 5. This example demonstrates a
 20 method for generation of substantially homogeneous

preparations of monopegylated Myelopoietin (MPO) using a hydrolyzable linkage.

EXAMPLE 12

5

Straight chain 20,000 MW PEG-HZ MPO



PEG-Hydrazide 20,000 MW

10 This example demonstrates a method for generation of substantially homogeneous preparations of pegylated Myelopoietin (MPO) using 20,000 MW methoxy-PEG-hydrazide, PEG-HZ (Shearwater Polymers Inc.). MPO protein stock solution dissolved at 4-8 mg/mL in 250 mM
15 MES, pH 4 - 5. The solution was then reacted with PEG-HZ by addition of solid to yield a relative PEG:Myelopoietin molar ratio of 6.5 - 26:1 reactions were catalyzed with carbodiimide (EDC, EOAC) at a final concentration of 2mM. Reactions were carried
20 out at 4°C for 2 hours. Reactions were stopped by lowering the pH to 4 with 0.1 N acetic acid.

EXAMPLES 13

25 Multi-pegylated species

Modified MPOs having two or more PEGs (multi-pegylated) attached were also obtained from Examples 1-12 and were separated from the mono-pegylated using either anion or
30 cation exchange chromatography.

EXAMPLE 14

Purification of Pegylated MPO

5 Pegylated MPO species were purified from the reaction mixture to >95% (SEC analysis) using either a single anion or cation exchange chromatography step (FIG 1). While the present example shows the purification of 20K PEG-ALD MPO or 30K PEG-ALD MPO it is understood that
10 similar purification methods could be used for other MPO molecules exemplified or disclosed herein.

Anion exchange chromatography

Anion exchange chromatography was carried out on a 5 mL
15 Hitrap Q column (Pharmacia Biotech) equilibrated in 50 mM Tris pH 9.0 (Buffer A). The reaction mixture was diluted 5 fold with buffer A and loaded onto the column at a flow rate of 5 mL/min. Next, the column was washed with 5 column volumes of buffer A, followed by elution
20 of the pegylated-MPO with a linear gradient of 0 to 20% buffer B (50 mM Tris pH 9.0, 1 M NaCl) in 20 column volumes. The eluant was monitored at 280 nm and 2 mL fractions were collected. Fractions containing monopegylated-MPO were pooled.

25

Cation Exchange Chromatography

Cation exchange chromatography was carried out on an SP Sepharose high performance column (Pharmacia XK 26/20, 70 ml bed volume) equilibrated in 10 mM sodium acetate
30 pH 4.5 (Buffer C). The reaction mixture was diluted 10X with buffer C and loaded onto the column at a flow rate of 5 mL/min. Next the column was washed with 5 column volumes of buffer C, followed by 5 column volumes of 12% buffer D (10 mM acetate pH 4.5, 1 M

NaCl). Subsequently, the PEG-MPO species were eluted from the column with a linear gradient of 12 to 27% buffer D in 20 column volumes. The eluant was monitored at 280 nm and 10 mL fractions were collected. Fractions were pooled according to extent of pegylation (mono, di, tri etc.), exchanged into 10 mM acetate pH 4.5 buffer and concentrated to 1-5 mg/mL in a stirred cell fitted with an Amicon YM10 membrane. Protein concentration of pool was determined by A280 nm using an extinction coefficient of 0.71. Total yield of monopegylated MPO from this process was 10 to 50%.

EXAMPLE 15

Biochemical Characterization

The purified pegylated MPO pools were characterized by SDS-PAGE (FIG 2), Size Exclusion Chromatography (FIG 3a & 3b), RP HPLC (FIG 4), Tryptic mapping (FIG 5), and Sedimentation Analysis (Table 1).

SDS PAGE

SDS PAGE was carried out on 1 mm thick 12% reducing Novex Tris glycine gels and stained using a Novex Colloidal Coomassie TM G-250 staining kit (FIG 2).

Size Exclusion High Performance Liquid Chromatography (SEC-HPLC)

Analytical SEC-HPLC was carried out using a Pharmacia Superdex 200 HR 10/30 column in 50 mM Tris pH 7.5, 150 mM NaCl at a flow rate of 0.4 mL/minute. PEG/protein elution was followed using a triple detector system

including UV monitor (220nm), differential refractometer (RI), and light scattering (LS) detector. FIG 3a shows a single peak corresponding to N-terminally monopegylated MPO and a single peak
5 corresponding to MPO.

N-terminal Sequence and Peptide Mapping

Following purification, Pegylated MPO (ie. 20K PEG-ALD MPO or 30K PEG-ALD MPO) was buffer-exchanged into a dilution buffer comprised of 10mM Tris, pH 7.5/1X Modified Dulbecco's phosphate-buffered saline (MD-PBS) to a concentration of >2mg/ml using centrifugal concentration (Microsep™ Filtron, 10K Fast-Flux). N-
15 terminal sequence analysis was determined (PE-Biosystems Model 494 Procise) and sample aliquots were digested overnight at 37°C using trypsin (Promega, V511C, from porcine) at 1:50 E:S. Digestions were quenched with 1M HCl and tryptic maps were then
20 effected using a Vydac C-18 column eluted at 1.0ml/min flow-rate using an acetonitrile gradient of ~0.33%/minute in 0.1% TFA. N-terminal sequence analysis and MALDI-TOF MS (PerSeptive Biosystems Voyager-DE™RP BioSpectrometry Workstation) were used to
25 identify the disulfide-linked N-terminal fragment(s) in the tryptic profile of control MPO.

N-terminal sequence analysis for both 20K PEG-ALD MPO and 30K PEG-ALD MPO revealed N-terminal heterogeneity,
30 suggesting the presence of a combination of free N-terminal alanine as well as preview sequence coming from the N-alkylated (PEGylated) sample component. Differences in relative Edman degradation efficiency for free protein versus alkylated proteins, however,

preclude absolute quantitation. As such, tryptic map profiling (FIG 5) was utilized to indicate that ~90% of the pegylated MPO (both 20,000 and 30,000 PEG-ALD MPO species) was pegylated on the α -NH₂ group of the N-terminal alanine residue when judged by the relative decrease in intensity of the N-terminal disulfide-linked peptide(s) (peak between 105 and 120) compared to a tryptic map of control MPO. Since HPLC-SEC data had previously indicated that both pegylated-MPO species were quantitatively pegylated, it is likely that the other 10% of the pegylated MPO samples are pegylated elsewhere in the molecule, *i.e.* most likely on one or more of the ϵ -NH₂ groups of internal lysine residues, noting that there were only subtle differences observed for the other, non-N-terminal peaks in the fingerprint(s) as developed. MALDI-MS and N-terminal sequence analysis were used to positively identify the N-terminal fragment(s) in the map of control MPO, but were somewhat less definitive as tools for the identification of the more hydrophobic difference peaks eluting from the maps of the PEGylated MPO samples presumably due to the complex nature of these fragments.

25 *Reversed Phase HPLC (RP HPLC)*

RP HPLC was carried out on a Phenomenex Jupiter C₁₈ column (4.6 X 250 mm, 5 μ m particle size) at a temperature of 50°C. Samples were loaded onto the column equilibrated in 40% acetonitrile, 0.1% TFA at 1 mL/min. The column was washed with 3 mL 58% acetonitrile. Subsequently, the protein was eluted with a gradient from 58 to 63% acetonitrile over 27 minutes. The

monopegylated MPO species eluted as a single peak (FIG 4) .

Sedimentation analysis

5

The hydrodynamic radii of the two PEGylated MPO molecules (20K PEG-ALD MPO and the 30K PEG-ALD MPO) were determined using analytical ultracentrifugation technology. In sedimentation velocity experiments, one can measure the sedimentation coefficient "s" and the diffusional coefficient "D". From D, one can calculate the hydrodynamic radius (Rh) using the Stokes-Einstein Equation. Using the s/D ratio, one can calculate the molecular weight. TABLE 1 shows data from sedimentation velocity experiments carried out on MPO, N-terminally mono-PEGylated 20,000 MW PEG MPO, and N-terminally mono-PEGylated 30,000 MW PEG MPO.

20

TABLE 1

Sedimentation Velocity Results

Hydrodynamic Radii and Molecular Weights

Sample	s Svedberg	Experimental D $10^{-7} \text{ cm}^2/\text{s}$	Experimental M _w (from s/D ratio) (Daltons)	MW based on AA sequence and PEG size	Experimental R _h	Theoret. R _h
MPO	2.293	6.16	35,300	34,800	34.2	33.7
20 K PEG-ALD MPO	1.774	3.52	55,650	54,800	59.9	59.0
30 K PEG-ALD MPO	1.628	2.52	74,610	64,800	83.6	72.6

25

EXAMPLE 16

BAF 3/G-CSFR Cell proliferation assay

5 Mouse BaF 3 cell line transfected with genes encoding the human G-CSF (mBaF 3/hG-CSFR) receptor were used to examine hG-CSF agonist activity. mBaF3/hG-CSFR cells were seeded at 2.5×10^4 cells/well in 96 well microtiter plates containing serial dilution of

10 cytokines. Cells were pulsed at T₅₆ hours with [methyl-³H]-thymidine at 0.5 mCi per well for 18 hours. Plates were harvested onto glass fiber filter mats, and the incorporated radioactivity was measured by scintillation spectroscopy. The assay medium for the

15 cell lines consisted of IMDM supplemented with bovine serum albumin (BSA, 500 µg/ml, Boehringer Mannheim), human transferrin (100 µg/ml, Sigma), a lipid substitute consisting of 2.5 mg of phosphatidyl choline/ml of BSA and 50 mM 2-mercaptoethanol. N-

20 terminally pegylated MPO was active in this assay. TABLE 2 compares the *in vitro* IL-3 receptor and G-CSF receptor agonist bioactivities of mono and di- PEG-MPO species with un-PEGylated MPO.

TABLE 2

		Relative Potency		
		<u>AML</u>	<u>TF-1</u>	<u>BAF3/G-CSFR</u>
5	<u>MPO species</u>			
	MPO	1.0	1.0	1.0
	<u>PEG-ALD</u>			
	5K PEG MPO	0.124	0.144	0.775
10	20K PEG MPO	0.088	0.113	0.955
	30K PEG MPO	0.133	0.149	0.870
	di5K PEG MPO	0.093	0.105	1.509
	di30K PEG MPO	0.051	0.092	1.502
15	<u>PEG-NHS</u>			
	20K PEG MPO	0.268	0.600	1.696
	di20K PEG MPO	0.123	0.278	3.192
	tetra5K PEG MPO	0.086	0.090	4.216
	tetra5K NHS-SS PEG MPO	0.179	0.226	3.962
20	10K-Branch PEG MPO	0.297	0.632	0.980
	20K-Branch PEG MPO	0.281	0.550	1.505
	40K-Branch PEG MPO	0.337	0.613	1.654
	di10K-Branch PEG MPO	0.097	0.147	1.105
25	<u>PEG-BTC</u>			
	20K PEG MPO	0.321	0.925	4.686
	<u>PEG-Hydrazide</u>			
	20K PEG MPO	0.149	0.250	1.717
30	di20K PEG MPO	0.129	0.165	1.757

EXAMPLE 17

TF-1 proliferation assay

5 Human TF-1 cells, which express the hIL3 receptor were used to identify hIL-3 receptor agonist activity. Human TF-1 cells were seeded at 1.25×10^4 cells/well in 96 well microtiter plates containing serial dilutions of cytokines. Cells were pulsed at T_{72} hours with [methyl-³H]-thymidine at 0.5 mCi per well for 6 hours. Plates
10 were harvested onto glass fiber filter mats, and the incorporated radioactivity was measured by scintillation spectroscopy. The assay medium for the cell lines consisted of IMDM supplemented with bovine
15 serum albumin (BSA, 500 μ g/ml, Boehringer Mannheim), human transferrin (100 μ g/ml, Sigma), a lipid substitute consisting of 2.5 μ g of phosphatidyl choline/ml of BSA and 50 mM 2-mercaptoethanol. N-terminally pegylated MPO was active in this assay.
20 TABLE 2 compares the *in vitro* IL-3 receptor and G-CSF receptor agonist bioactivities of assorted PEG-MPO species with un-PEGylated MPO.

EXAMPLE 18

25

AML proliferation assay

Human AML cells, which express the hIL3 and hG-CSF receptors were also used to measure MPO *in vitro*
30 receptor agonist activity. Human AML cells were seeded at 2.5×10^4 cells/well in 96 well microtiter plates containing a serial dilution of cytokines. Cells were pulsed at T_{72} hours with [methyl-³H]-thymidine at 0.5 mCi per well for 24 hours. Plates were harvested onto

glass fiber filter mats, and the incorporated radioactivity was measured by scintillation spectroscopy. The assay medium for the cell lines consisted of IMDM supplemented with bovine serum albumin (BSA, 500 µg/ml, Boehringer Mannheim), human transferrin (100 µg/ml, Sigma), a lipid substitute consisting of 2.5 µg of phosphatidyl choline/ml of BSA and 50 mM 2-mercaptoethanol. N-terminally pegylated MPO was active in this assay. TABLE 2 compares the *in vitro* IL-3 receptor and G-CSF receptor agonist bioactivities of assorted PEG-MPO species with un-PEGylated MPO.

EXAMPLE 19

15 *CD34⁺ cell proliferation assays*

Further assessment of the *in vitro* biological activity of N-terminally pegylated MPO (PEG-ALD MPO) was carried out in bone marrow CD34⁺ cell proliferation bioassays. Fresh bone marrow aspirates were obtained through a collaboration with the St. Louis University Medical School. Mononuclear cell fractions were recovered following density gradient centrifugation with Ficoll-Hypaque. CD34⁺ (stem and progenitor) cells were subsequently isolated by positive selection using the Isolex 50 stem cell reagent kit (Baxter Healthcare Corporation, Deerfield, IL). This procedure yields an enriched cellular product where >90% of the cells express the CD34⁺ cell surface antigen. For proliferation assays, the CD34⁺ cells were incubated overnight at 4°C in X-VIVO 10 media supplemented with 1% Human Serum Albumin. Following this incubation, the cells were washed, resuspended in X-VIVO 10 with 1% HSA, counted for viability and plated at 1×10^3

cells/well in 96 well microtiter plates containing a serial dilution of cytokines. Concentrations of the respective receptor agonists in co-addition experiments were equimolar at the indicated concentration value.

5 After 6 days, cells were pulsed with [methyl-³H]-thymidine at 0.5 mCi per well for 7 hr, harvested onto glass fiber filter mats, and the incorporated radioactivity was measured by scintillation spectroscopy. The N-terminally pegylated MPO yielded

10 proliferative responses slightly less than unmodified MPO yet greater or equal to the responses from co-administration of IL-3 and G-CSF.

EXAMPLE 20

15

CFU-GM clonogenic assays

Expansion of hematopoietic progenitors was demonstrated using human bone marrow-derived CD34+ cells in a colony

20 forming unit granulocyte/macrophage (CFU-GM) assay, where clonogenic progenitors divide and differentiate in a semi-solid media in response to growth factors. CD34⁺ cells (isolated as described in example 19) were seeded in 35 mm tissue culture plates (10,000

25 cells/dish) in MethoCult H4230 (StemCell Technologies, Vancouver, BC) containing 0.9% Methylcellulose in IMDM, 30% FBS, 1% BSA, 1×10^{-4} M 2-mercaptoethanol and 2mM L-glutamine.

Cultures were incubated with growth factors for 10-12

30 days at 37°C in humidified air containing 5% CO₂. The concentrations of the respective receptor agonists in co-addition experiments are equimolar each at the indicated concentration value. Hematopoietic colonies (>50 cells) were counted using an inverted microscope.

FIG 6 shows that the unmodified MPO molecule induces differentiation and expansion of hematopoietic progenitor cells into colony forming unit granulocyte/macrophage cells (CFU-GM) greater or equal
5 to the responses from co-administration of hIL-3 and G-CSF.

Example 21

10 *Normal Rhesus Monkey studies*

The pharmacology of N-terminally pegylated MPO was assessed in normal Rhesus monkey (*Macaca mulatta*) studies. Rhesus monkeys (~5 Kg) were acclimated for 2
15 weeks during which the baseline blood data were collected. Monkeys were given a single dose of PEG-MPO or control MPO by subcutaneous (SC), or intravenous (IV) injection. Monkeys were observed for clinical pharmacokinetics (PK) and pharmacodynamics (PD)
20 parameters up to 50 days post dosing. Blood samples were taken at regular intervals and hematological analyses were performed. Samples were dosed SC at 20 and 200 mg/kg. IV dosing studies were carried out at 10 mg/kg. Blood samples were taken at regular intervals
25 and hematological analyses were performed. Plasma samples were collected before dosing and at 0.5, 1, 2, 4, 6, 8, 14, 23.5, 47.5, 71.5, and 95.5 hr. after dosing.

30

Example 22

Normal Rhesus Pharmacokinetics

MPO protein concentration levels in rhesus plasma for PK analysis were determined using a sandwich ELISA. 96-well microtiter plates were coated with 150-µL/well affinity-purified goat-anti-G-CSF polyclonal diluted to 5 1mg/mL in 100 mM NaHCO₃, pH 8.2. Plates were incubated overnight at room temperature in a humidified chamber and blocked for one hour at 37°C with phosphate buffered saline, containing 3% bovine serum albumin (BSA) and 0.05% Poly(oxyethylene)-Sorbitan Monolaurate 10 (Tween 20), pH 7.4. Plates were washed four times with 150 mM NaCl containing 0.05% Tween 20 (wash buffer). Plasma PK samples were initially diluted in assay buffer (PBS, 0.1% BSA, 0.01% Tween 20 pH 7.4), added to the plate and serially diluted 1:2 in an assay matrix of 15 untreated Rhesus pooled plasma. The plasma concentration of the matrix and the samples were matched by percentage. Plates were incubated for 2.5 hours at 37°C in a humidified chamber, then washed 4 times. Wells were washed four times. Affinity 20 purified goat-anti-hIL3 receptor agonist polyclonal antibody was diluted 1:5000 in assay buffer and 150 µg/mL well were added to each plate. Plates were incubated for 1.5 hours at 37°C in a humidified chamber. Wells were emptied and each well was again 25 washed four times with wash buffer. Each well then received 150 µL of TMB peroxidase substrate solution. Plates were incubated at room temperature for 10 minutes and read at a test wavelength of 650 nm on a microtiter plate reader (Molecular Devices 30 Corporation). Concentrations of immuno-reactive MPO in unknown PK samples were calculated from a standard curve using a four-parameter curve-fitting program supplied by Molecular Devices. Plasma concentration data and pharmacokinetic parameters, which were derived

from non-compartmental analysis, are shown in TABLE 3. The results indicate that the plasma residence time of the N-terminally pegylated MPO is greatly protracted when compared to the unmodified MPO. Pegylation
5 dramatically increases the drug exposure as AUC increases ~7-9 fold and ~10-20 fold for 20K and 30K PEG-MPO, respectively, compared to the unmodified MPO; and clearance rates decreased by up to 10 and 20 fold for 20K and 30K MPO, respectively, at the higher dose
10 tested. MPO exposure increases in greater-than-proportional manner with dose, which indicates a non-linear PK saturation of some "early" clearance mechanism. The IV profile suggests multi-phasic elimination distribution into a "deeper" compartment.
15 Absolute bioavailability of PEG-MPO appears to be approximately 50% (data not shown).

TABLE 3 compares the *in vivo* pharmacokinetics of un-PEGylated and N-terminally mono-PEGylated 20,000 MW and
20 30,000 MW PEG-ALD MPO after a single subcutaneous dose in normal Rhesus monkeys.

TABLE 3
Plasma Concentration Data and Pharmacokinetic Parameters following a single
subcutaneous dose of MPO, 20,000 MW OR 30,000 PEG-ALD MPO

Time (hr) Post-dose	MPO 20 μg/kg	20,000 MW PEG- ALD MPO 20 μg/kg	30,000 MW PEG- ALD MPO 20 μg/kg	MPO 200 μg/kg	20,000 MW PEG- ALD MPO 200 μg/kg	30,000 MW PEG- ALD MPO 200 μg/kg	
0	0 ^a	0.44	0	0	0.61	0	
0.5	1.00	11.0	1.60	110	134	168	
1	2.90	19.8	6.90	227	254	372	
2	5.90	44.3	22.7	298	540	686	
4	13.6	49.2	57.8	365	480	1530	
6	9.45	42.1	70.1	404	700	1670	
8	4.45	32.5	60.9	285	791	1980	
14	1.05	11.9	16.6	140	841	1870	
23.5	0.20	5.93	10.9	17.6	851	1710	
47.5	0	1.03	1.90	0	282	916	
71.5	NS	0	0.35	0	9.10	6.48	
95.5	NS	0	0	NS	2.75	2.31	
119.5	NS	NS	NS	NS	0	0	
Pharmacokinetic Parameters ^b							units
C _{max}	13.6	49.2	70.1	425	955	2040	ng/mL
T _{max}	4	4	6	4.00	15.8	11	hr
AUC (0-24 hr)	84.6	520	725	3770	17600	38300	nG- hr/mL
AUC all	86.9	616	904	3900	34400	81100	nG- hr/mL
t _{last}	23.5	35.5	59.5	18.8	83.5	95.5	hr
T _{1/2}	3.23	9.02	10.1	3.8	8.08	7.81	hr
AUC (I)	85.3	610	905	3820	34400	81100	nG- hr/mL
CL/F	234	48.2	22.1	52.5	5.83	2.47	mL/hr- kg
V _d /F	1090	561	323	285	67.5	27.7	mL/kg

5 ^a ng protein/mL plasma (n=2)

^b Pharmacokinetic parameters derived from one compartmental analysis

NS - no sample

C_{max} - maximum concentration in plasma

T_{max} - time at which C_{max} is achieved

10 AUC (0-24 hr) - Area under the curve from 0 to 24 hours

AUC all - total area under the curve

AUC (I) - AUC infinity

T_{last} - final time point at which sample is detected

T_{1/2} - terminal half life

15 CL - clearance rate

F - Bioavailability - fraction of dose reaching systemic circulation V_d - volume distribution

EXAMPLE 23

Normal Rhesus Pharmacodynamics

5 Normal rhesus plasma samples were also analyzed for MPO pharmacological responses. Leukocytes were counted in a Technicon H1E Hematology Analyzer (Technicon Instruments Corp.). FIG 7 shows profiles for absolute neutrophil count (ANC) following SC dosing at 200 $\mu\text{g/kg}$ as described above. A dramatic protraction in the WBC and ANC response is observed with pegylated MPO. Also observed was a nearly identical 5-fold increase in WBC counts (C_{max}) after a single SC administration of either MPO or pegylated MPO (PEG-ALD MPO) at 200 $\mu\text{g/kg}$ to
15 normal rhesus monkeys was driven by a 8-fold increase in neutrophil numbers within 8 hrs. Elevated total WBC and ANC levels returned to pretreatment levels within 3 or 4 days after dosing with MPO at 200 $\mu\text{g/kg}$. Both the 20,000 PEG MPO and 30,000 MW pegylated MPO maintained
20 elevated levels for over 160 hours with the latter yielding a remarkable increase (~6 fold) in total ANC at 80-100 hours compared to unmodified MPO. These data show good correlation with increases in the pharmacokinetic profile described above.

25

EXAMPLE 27

Myelosuppressed rhesus (efficacy) studies

30 Male rhesus monkeys were housed in individual stainless steel cages in conventional holding rooms in animal facilities accredited by the American Association for Accreditation of Laboratory Care. Following a prehabitation period, monkeys were unilaterally

irradiated in Lucite restraining chairs with 250 kVp x-radiation at 13 cGy/min in the post-anterior position, rotated 180° at the mid-dose (300 cGy) to the anterior-posterior position for completion of the total 600 cGy midline tissue exposure and randomly assigned to a treatment protocol utilizing pegylated MPO or control autologous serum (AS). Pegylated MPO (30K PEG-ALD MPO) was subcutaneously administered according to the following two protocols: a) as two doses [200 µg/kg, n=4] given one day and seven days following TBI, b) as two doses [200 µg/kg, n=4] given one day and four days following TBI, or c) as a single dose (600 µg/kg, n=5) given one day following TBI. The irradiation controls (n=7) received 0.1% autologous serum (AS), daily for 18 days. Complete blood counts were monitored for up to 70 days following irradiation and the durations of neutropenia [absolute neutrophil count (ANC) < 500/µL] and thrombocytopenia (platelets (PLT) < 20,000/µL) were assessed. All animals received clinical support, which consisted of antibiotics, fresh irradiated whole blood, and fluids as needed. An antibiotic regimen was initiated prophylactically when the white blood cell count (WBC) was <1000/µL and continued daily until the WBC was >1000/µL for three consecutive days. Fresh, irradiated (1500 cGy Co-60) whole blood (approximately 30 mLs/transfusion) from a random donor pool was administered when the PLT count was < 20,000/µL and the hematocrit was <18%. Hematologic evaluations were determined using peripheral blood drawn from the saphenous vein in order to assay complete blood (Sysmex K-4500) and differential counts (Wright-Giemsa Stain). TABLE 4 shows the efficacy of N-terminally mono-PEGylated 30,000 MW PEG MPO in a Rhesus monkey model of myelosuppression. Clinically relevant indicators such

as days where ANC's fell below 500/ml , ANC nadir, days to recovery, and days on antibiotics were measured for N-terminally mono-pegylated MPO using three dosing schedules.

- 5 One or more Key indicators in this model for clinical efficacy improve at all dosing schedules for pegylated MPO when compared to daily administration of un-Pegylated-MPO as a comparator.

10

TABLE 4

Treatment	ANC < 500 μl^{-1} (days)	ANC Nadir (μl^{-1})	Recovery (day)	Antibiotics (days)
0.1% AS (7)	14.8	8	20.8	16.8
MPO - QD (d1-18) 200 $\mu\text{g/kg}$ (n=4)	2.8	435	8.3	8.3
MPO - QOD (d1-17) 200 $\mu\text{g/kg}$ (n=8)	1.0	601	4.1	5.8
MPO - QD1 600 $\mu\text{g/kg}$ (n=4)	11.8	164	19.3	18.0
30K PEG-ALD MPO 200 $\mu\text{g/kg}$ d1,d4 (n=4)	3.0	244	8.8	6.8
30K PEG-ALD MPO 200 $\mu\text{g/kg}$ d1,d7 (n=4)	2.0	377	6.8	6.3
30K PEG-ALD MPO QD1 600 $\mu\text{g/kg}$ (n=5)	2.6	837	7.0	6.2

Treatment	PLT < 20000 μl^{-1} (days)	PLT Nadir (μl^{-1})	Recovery (day)	Number Transfusions
0.1% AS (7)	7.5	3,000	18.5	1.0
MPO - QD (d1-18) 200 $\mu\text{g/kg}$ (n=4)	4.0	20,500	12.0	0
MPO - QOD (d1-17) 200 $\mu\text{g/kg}$ (n=8)	1.6	22,000	7.8	0
MPO - QD1 600 $\mu\text{g/kg}$ (n=4)	0.3	27,750	2.8	0
30K PEG-ALD MPO 200 $\mu\text{g/kg}$ d1,d4 (n=4)	1.0	21,500	7.3	0
30K PEG-ALD MPO 200 $\mu\text{g/kg}$ d1,d7 (n=4)	0.3	22,250	6.8	0
30K PEG-ALD MPO QD1 600 $\mu\text{g/kg}$ (n=5)	0.6	28,400	5.8	0.2

15

Example 28

Normal Rat Pharmacokinetics and Pharmacodynamics (PK/PD)

- 5 The pharmacokinetic and pharmacodynamic properties of PEGylated MPO molecules were assessed in normal rats. Male Sprague Dawley rats in groups of 5 were given a single subcutaneous injection of PEGylated MPO or control MPO at 500ug/kg. Blood samples were taken at
10 regular intervals and analyzed for plasma protein concentrations and pharmacological responses as described in Examples 22 and 23.

15

TABLE 5

	PK			PD
	MPO conc. (ng /mL plasma)			AUC (Neutrophils hours /nL plasma)
	24hr	48hr	72hr	
30K PEG ALD MPO	634	326	13	2026
20K PEG ALD MPO	468	242	1	2299
5K PEG ALD MPO	503	2	0	1866
di5K PEG ALD MPO	970	158	7	2156
40K Branch PEG2-NHS MPO	1539	518	19	2268
20K Branch PEG2-NHS MPO	301	72	7	2093
20K PEG-SPA MPO	711	139	2	1761
di20K PEG – SPA MPO	735	360	33	2329
10K Branch PEG NHS MPO	982	157	0	1384
di10K Branch PEG2-NHS MPO	945	247	10	1490
tetra 20K PEG- BTC MPO	572	192	10	2316
20K PEG-HZ MPO	2155	709	91	2569
di20K PEG-HZ MPO	499	289	47	3010
tetra5K PEG-SS MPO	881	40	0	1838
tetra5K PEG- SPA MPO	710	137	11	2272
di30K PEG- ALD MPO	504	193	28	2275
MPO	14	1	0	693

WHAT IS CLAIMED IS:

1. A Myelopoietin conjugate having at least one water-soluble polymer molecule covalently attached to at least one amino acid residue of a biologically active Myelopoietin polypeptide.

2. The Myelopoietin conjugate of claim 1 wherein said Myelopoietin polypeptide comprises a sequence of the formula selected from the group consisting of;

R₁-L-R₂, R₂-L-R₁, R₁-R₂, R₂-L-R₁, Met-Ala-R₁-L-R₂, Met-Ala-R₂-L-R₁, Met-Ala-R₁-R₂, Met-Ala-R₂-R₁, Met-R₁-L-R₂, Met-R₂-L-R₁, Met-R₁-R₂, Met-R₂-R₁, Ala-R₁-L-R₂, Ala-R₂-L-R₁, Ala-R₁-R₂ and Ala-R₂-R₁;

wherein R₁ is a modified human interleukin-3 (hIL-3) amino acid sequence of SEQ ID NO:1;

wherein

Xaa at position 17 is Ser, Lys, Gly, Asp, Met, Gln, or Arg;

Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;

Xaa at position 19 is Met, Phe, Ile, Arg, Gly, Ala, or Cys;

Xaa at position 20 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;

Xaa at position 21 is Asp, Phe, Lys, Arg, Ala, Gly, Glu, Gln, Asn, Thr, Ser or Val;

Xaa at position 22 is Glu, Trp, Pro, Ser, Ala, His, Asp, Asn, Gln, Leu, Val or Gly;

Xaa at position 23 is Ile, Val, Ala, Leu, Gly, Trp, Lys, Phe, Ser, or Arg;

Xaa at position 24 is Ile, Gly, Val, Arg, Ser, Phe, or Leu;

Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;

Xaa at position 26 is His, Thr, Phe, Gly, Arg, Ala, or Trp;

Xaa at position 27 is Leu, Gly, Arg, Thr, Ser, or Ala;

Xaa at position 28 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp;

Xaa at position 29 is Gln, Asn, Leu, Pro, Arg, or Val;

Xaa at position 30 is Pro, His, Thr, Gly, Asp, Gln, Ser,

- Leu, or Lys;
- Xaa at position 31 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;
- Xaa at position 32 is Leu, Val, Arg, Gln, Asn, Gly, Ala, or Glu;
- Xaa at position 33 is Pro, Leu, Gln, Ala, Thr, or Glu;
- 5 Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Glu, Gln,
Thr, Arg, Ala, Phe, Ile or Met;
- Xaa at position 35 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;
- Xaa at position 36 is Asp, Leu, or Val;
- Xaa at position 37 is Phe, Ser, Pro, Trp, or Ile;
- 10 Xaa at position 38 is Asn, or Ala;
- Xaa at position 40 is Leu, Trp, or Arg;
- Xaa at position 41 is Asn, Cys, Arg, Leu, His, Met, or Pro;
- Xaa at position 42 is Gly, Asp, Ser, Cys, Asn, Lys, Thr,
Leu, Val, Glu, Phe, Tyr, Ile, Met or Ala;
- 15 Xaa at position 43 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala,
Cys, Gln, Arg, Thr, Gly or Ser;
- Xaa at position 44 is Asp, Ser, Leu, Arg, Lys, Thr, Met,
Trp, Glu, Asn, Gln, Ala or Pro;
- Xaa at position 45 is Gln, Pro, Phe, Val, Met, Leu, Thr,
- 20 Lys, Trp, Asp, Asn, Arg, Ser, Ala, Ile, Glu or His;
- Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, Glu, Asn,
Gln, Lys, His, Ala, Tyr, Ile, Val or Gly;
- Xaa at position 47 is Ile, Gly, Val, Ser, Arg, Pro, or His;
- Xaa at position 48 is Leu, Ser, Cys, Arg, Ile, His, Phe,
- 25 Glu, Lys, Thr, Ala, Met, Val or Asn;
- Xaa at position 49 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;
- Xaa at position 50 is Glu, Leu, Thr, Asp, Tyr, Lys, Asn,
Ser, Ala, Ile, Val, His, Phe, Met or Gln;
- Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;
- 30 Xaa at position 52 is Asn, His, Arg, Leu, Gly, Ser, or Thr;
- Xaa at position 53 is Leu, Thr, Ala, Gly, Glu, Pro, Lys,
Ser, or Met;
- Xaa at position 54 is Arg, Asp, Ile, Ser, Val, Thr, Gln,
Asn, Lys, His, Ala or Leu;
- 35 Xaa at position 55 is Arg, Thr, Val, Ser, Leu, or Gly;
- Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, Glu, Arg,
His, Thr, Ala, Tyr, Phe, Leu, Val or Lys;

- Xaa at position 57 is Asn or Gly;
- Xaa at position 58 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;
- Xaa at position 59 is Glu, Tyr, His, Leu, Pro, or Arg;
- Xaa at position 60 is Ala, Ser, Pro, Tyr, Asn, or Thr;
- 5 Xaa at position 61 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;
- Xaa at position 62 is Asn, His, Val, Arg, Pro, Thr, Asp, or Ile;
- Xaa at position 63 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val;
- Xaa at position 64 is Ala, Asn, Pro, Ser, or Lys;
- Xaa at position 65 is Val, Thr, Pro, His, Leu, Phe, or Ser;
- 10 Xaa at position 66 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;
- Xaa at position 67 is Ser, Ala, Phe, Val, Gly, Asn, Ile,
Pro, or His;
- Xaa at position 68 is Leu, Val, Trp, Ser, Ile, Phe, Thr, or His;
- Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, Trp,
- 15 Gly, or Leu;
- Xaa at position 70 is Asn, Leu, Val, Trp, Pro, or Ala;
- Xaa at position 71 is Ala, Met, Leu, Pro, Arg, Glu, Thr,
Gln, Trp, or Asn;
- Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;
- 20 Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;
- Xaa at position 74 is Ile, Met, Thr, Pro, Arg, Gly, Ala;
- Xaa at position 75 is Glu, Lys, Gly, Asp, Pro, Trp, Arg,
Ser, Gln, or Leu;
- Xaa at position 76 is Ser, Val, Ala, Asn, Trp, Glu, Pro,
- 25 Gly, or Asp;
- Xaa at position 77 is Ile, Ser, Arg, Thr, or Leu;
- Xaa at position 78 is Leu, Ala, Ser, Glu, Phe, Gly, or Arg;
- Xaa at position 79 is Lys, Thr, Asn, Met, Arg, Ile, Gly, or Asp;
- Xaa at position 80 is Asn, Trp, Val, Gly, Thr, Leu, Glu, or Arg;
- 30 Xaa at position 81 is Leu, Gln, Gly, Ala, Trp, Arg, Val, or Lys;
- Xaa at position 82 is Leu, Gln, Lys, Trp, Arg, Asp, Glu,
Asn, His, Thr, Ser, Ala, Tyr, Phe, Ile, Met or Val;
- Xaa at position 83 is Pro, Ala, Thr, Trp, Arg, or Met;
- Xaa at position 84 is Cys, Glu, Gly, Arg, Met, or Val;
- 35 Xaa at position 85 is Leu, Asn, Val, or Gln;
- Xaa at position 86 is Pro, Cys, Arg, Ala, or Lys;
- Xaa at position 87 is Leu, Ser, Trp, or Gly;

- Xaa at position 88 is Ala, Lys, Arg, Val, or Trp;
Xaa at position 89 is Thr, Asp, Cys, Leu, Val, Glu, His,
Asn, or Ser;
Xaa at position 90 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met;
5 Xaa at position 91 is Ala, Pro, Ser, Thr, Phe, Leu, Asp, or His;
Xaa at position 92 is Pro, Phe, Arg, Ser, Lys, His, Ala,
Gly, Ile or Leu;
Xaa at position 93 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;
Xaa at position 94 is Arg, Ile, Ser, Glu, Leu, Val, Gln,
10 Lys, His, Ala, or Pro;
Xaa at position 95 is His, Gln, Pro, Arg, Val, Leu, Gly,
Thr, Asn, Lys, Ser, Ala, Trp, Phe, Ile, or Tyr;
Xaa at position 96 is Pro, Lys, Tyr, Gly, Ile, or Thr;
Xaa at position 97 is Ile, Val, Lys, Ala, or Asn;
15 Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr,
Glu, Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro;
Xaa at position 99 is Ile, Leu, Arg, Asp, Val, Pro, Gln,
Gly, Ser, Phe, or His;
Xaa at position 100 is Lys, Tyr, Leu, His, Arg, Ile, Ser,
20 Gln, or Pro;
Xaa at position 101 is Asp;
Xaa at position 102 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;
Xaa at position 103 is Asp, or Ser;
Xaa at position 104 is Trp, Val, Cys, Tyr, Thr, Met, Pro,
25 Leu, Gln, Lys, Ala, Phe, or Gly;
Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Trp, Gln,
Tyr, Leu, Lys, Ile, Asp, or His;
Xaa at position 106 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;
Xaa at position 108 is Arg, Lys, Asp, Leu, Thr, Ile, Gln,
30 His, Ser, Ala or Pro;
Xaa at position 109 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly;
Xaa at position 110 is Lys, Ala, Asn, Thr, Leu, Arg, Gln,
His, Glu, Ser, Ala, or Trp;
Xaa at position 111 is Leu, Ile, Arg, Asp, or Met;
35 Xaa at position 112 is Thr, Val, Gln, Tyr, Glu, His, Ser, or Phe;
Xaa at position 113 is Phe, Ser, Cys, His, Gly, Trp, Tyr,
Asp, Lys, Leu, Ile, Val or Asn;

Xaa at position 114 is Tyr, Cys, His, Ser, Trp, Arg, or Leu;

Xaa at position 115 is Leu, Asn, Val, Pro, Arg, Ala, His,
Thr, Trp, or Met;

Xaa at position 116 is Lys;

5 Xaa at position 117 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;

Xaa at position 118 is Leu, Ser, Pro, Ala, Glu, Cys, Asp, or Tyr;

Xaa at position 119 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg;

Xaa at position 120 is Asn, Ala, Pro, Leu, His, Val, or Gln;

Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or Gly;

10 Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, Pro,
His, Ile, Tyr, or Cys;

Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

wherein from 1 to about 44 of the amino acids designated
15 by Xaa are different from the corresponding amino acids
of native (1-133) human interleukin-3; and wherein from
1 to 14 amino acids are optionally deleted from the N-
terminus and/or from 1 to 15 amino acids are optionally
deleted from the C-terminus of said sequence of SEQ ID
20 NO:1;

R₂ is a factor selected from the group consisting
of: a colony stimulating factor, a cytokine, a
lymphokine, an interleukin, and a hematopoietic growth
25 factor; and

L is a linker capable of linking R₁ to R₂.

3. The Myelopietin conjugate of claim 2 wherein
30 in said Myelopietin polypeptide said factor is selected
from the group consisting of;

GM-CSF, G-CSF, G-CSF Ser¹⁷, c-mpl ligand (TPO),
MGDF, M-CSF, erythropoietin (EPO), IL-1, IL-4, IL-2, IL-
35 3, IL-5, IL 6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12,

IL-13, IL-15, LIF, flt3/flk2 ligand, and stem cell factor (SCF).

4. The Myelopoietin conjugate of claim 1 wherein
 5 in said biologically active Myelopoietin polypeptide R₁
 is selected from the group consisting of:

SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID
 NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID
 10 NO:16, SEQ ID NO:17, SEQ ID NO:18, SEQ ID NO:19, SEQ ID
 NO:20, SEQ ID NO:21, SEQ ID NO:22, SEQ ID NO:23, SEQ ID
 NO:24, SEQ ID NO:25, residues 2-113 of SEQ ID NO:25,
 residues 3-113 of SEQ ID NO:25, SEQ ID NO:26, residues
 2-113 of SEQ ID NO:26, residues 3-113 of SEQ ID NO:26,
 15 SEQ ID NO:27, residues 2-113 of SEQ ID NO:27, residues
 3-113 of SEQ ID NO:27, SEQ ID NO:28, residues 2-113 of
 SEQ ID NO:28, residues 3-113 of SEQ ID NO:28, SEQ ID
 NO:29, residues 2-113 of SEQ ID NO:29, residues 3-113 of
 SEQ ID NO:29, SEQ ID NO:30, residues 2-113 of SEQ ID
 20 NO:30, residues 3-113 of SEQ ID NO:30, SEQ ID NO:31,
 residues 2-113 of SEQ ID NO:31, residues 3-113 of SEQ ID
 NO:31, SEQ ID NO:32, residues 2-113 of SEQ ID NO:32,
 residues 3-113 of SEQ ID NO:32, SEQ ID NO:33, residues
 2-113 of SEQ ID NO:33, residues 3-113 of SEQ ID NO:33,
 25 SEQ ID NO:34, residues 2-113 of SEQ ID NO:34, residues
 3-113 of SEQ ID NO:34, SEQ ID NO:35, residues 2-113 of
 SEQ ID NO:35, residues 3-113 of SEQ ID NO:35, SEQ ID
 NO:36, residues 2-113 of SEQ ID NO:36, residues 3-113 of
 SEQ ID NO:36, SEQ ID NO:37, residues 2-113 of SEQ ID
 30 NO:37, residues 3-113 of SEQ ID NO:37, SEQ ID NO:38,
 residues 2-113 of SEQ ID NO:38, residues 3-113 of SEQ ID
 NO:38, SEQ ID NO:39, residues 2-113 of SEQ ID NO:39,
 residues 3-113 of SEQ ID NO:39, SEQ ID NO:40, residues
 2-113 of SEQ ID NO:40, residues 3-113 of SEQ ID NO:41,
 35 SEQ ID NO:42, SEQ ID NO:43, residues 2-113 of SEQ ID

NO:43, residues 3-113 of SEQ ID NO:43, SEQ ID NO:44,
 residues 2-113 of SEQ ID NO:45, residues 3-113 of SEQ ID
 NO:45, SEQ ID NO:48, residues 2-113 of SEQ ID NO:48,
 residues 3-113 of SEQ ID NO:48, SEQ ID NO:49, residues
 5 2-113 of SEQ ID NO:49, residues 3-113 of SEQ ID NO:49,
 SEQ ID NO:53 through SEQ ID NO:120, residues 2-113 of
 SEQ ID NO:53 through SEQ ID NO:120, residues 3-113 of
 SEQ ID NO:53 through SEQ ID NO:120.

10 5. The Myelopoiectin conjugate of claim 1 where
 said biologically active Myelopoiectin polypeptide is
 selected from the group consisting of:

SEQ ID NO:121-124, 134, 135, 146, 147, 152, 158,
 15 159, residues 2-307 of SEQ ID NO:121-124, 134, 135, 146,
 147, 152, 158, 159, residues 3-307 of SEQ ID NO:121-124,
 134, 135, 146, 147, 152, 158, 159, SEQ ID NO:125-127,
 136, 153, residues 2-244 of SEQ ID NO:125-127, 136, 153,
 residues 3-244 of SEQ ID NO:125-127, 136, 153, SEQ ID
 20 NO:128-130, 138, 149, 150, 154, 156, 157, residues 2-322
 of SEQ ID NO: 128-130, 138, 149, 150, 154, 156, 157,
 residues 3-322 of SEQ ID NO: 128-130, 138, 149, 150,
 154, 156, 157, SEQ ID NO:131-133, 137, 141, 155,
 residues 2-259 of SEQ ID NO:131-133, 137, 141, 155,
 25 residues 3-259 of SEQ ID NO:131-133, 137, 141, 155, SEQ
 ID NO:139, 151, residues 2-349 of SEQ ID NO:139, 151,
 residues 3-349 of SEQ ID NO:139, 151, SEQ ID NO:141,
 residues 2-301 of SEQ ID NO:141, residues 3-301 of SEQ
 ID NO:141, SEQ ID NO:143, residues 2-335 of SEQ ID
 30 NO:143, residues 3-335 of SEQ ID NO:143, SEQ ID NO:144,
 residues 2-274 of SEQ ID NO:144, residues 3-274 of SEQ
 ID NO:144, SEQ ID NO:145, residues 2-317 of SEQ ID
 NO:145, residues 3-317 of SEQ ID NO:145, SEQ ID NO:148,
 residues 2-337 of SEQ ID NO:148, residues 3-337 of SEQ
 35 ID NO:148, SEQ ID NO:165-167, residues 2-286 of SEQ ID

NO:165-167, residues 3-286 of SEQ ID NO:165-167, SEQ ID
NO:168, residues 2-290 of SEQ ID NO:168, residues 3-290
of SEQ ID NO:168, SEQ ID NO:178, SEQ ID NO:181, SEQ ID
NO:184, SEQ ID NO:187, SEQ ID NO:190, SEQ ID NO:193, SEQ
5 ID NO:196, SEQ ID NO:199, SEQ ID NO:202, SEQ ID NO:205,
SEQ ID NO:208, SEQ ID NO:211, SEQ ID NO:214, SEQ ID
NO:217, SEQ ID NO:220, SEQ ID NO:223, SEQ ID NO:226, SEQ
ID NO:229, SEQ ID NO:232, SEQ ID NO:235, SEQ ID NO:238,
SEQ ID NO:241, SEQ ID NO:244, SEQ ID NO:247, SEQ ID
10 NO:250, SEQ ID NO:253, SEQ ID NO:256, SEQ ID NO:259, SEQ
ID NO:262, SEQ ID NO:265, SEQ ID NO:268, SEQ ID NO:271,
SEQ ID NO:274, SEQ ID NO:277, SEQ ID NO:280, SEQ ID
NO:283, SEQ ID NO:286, SEQ ID NO:289, SEQ ID NO:292, SEQ
ID NO:295, SEQ ID NO:298, SEQ ID NO:301, SEQ ID NO:304,
15 SEQ ID NO:307, SEQ ID NO:310, SEQ ID NO:313, SEQ ID
NO:316, SEQ ID NO:319, SEQ ID NO:322, SEQ ID NO:325, SEQ
ID NO:328, SEQ ID NO:331, SEQ ID NO:334, SEQ ID NO:337,
SEQ ID NO:340, SEQ ID NO:343, SEQ ID NO:346, SEQ ID
NO:349, SEQ ID NO:352, SEQ ID NO:355, SEQ ID NO:358, SEQ
20 ID NO:361, SEQ ID NO:364, SEQ ID NO:367, SEQ ID NO:370,
SEQ ID NO:373, SEQ ID NO:376, SEQ ID NO:379, SEQ ID
NO:382, residues 2-307 of SEQ ID NO:178, residues 2-307
of SEQ ID NO:181, residues 2-307 of SEQ ID NO:184,
residues 2-307 of SEQ ID NO:187, residues 2-307 of SEQ
25 ID NO:190, residues 2-307 of SEQ ID NO:193, residues 2-
307 of SEQ ID NO:196, residues 2-307 of SEQ ID NO:199,
residues 2-307 of SEQ ID NO:202, residues 2-307 of SEQ
ID NO:205, residues 2-307 of SEQ ID NO:208, residues 2-
307 of SEQ ID NO:211, residues 2-307 of SEQ ID NO:214,
30 residues 2-307 of SEQ ID NO:217, residues 2-307 of SEQ
ID NO:220, residues 2-307 of SEQ ID NO:223, residues 2-
307 of SEQ ID NO:226, residues 2-307 of SEQ ID NO:229,
residues 2-307 of SEQ ID NO:232, residues 2-307 of SEQ
ID NO:235, residues 2-307 of SEQ ID NO:238, residues 2-
35 307 of SEQ ID NO:241, residues 2-307 of SEQ ID NO:244,

residues 2-307 of SEQ ID NO:247, residues 2-307 of SEQ
ID NO:250, residues 2-307 of SEQ ID NO:253, residues 2-
307 of SEQ ID NO:256, residues 2-307 of SEQ ID NO:259,
residues 2-307 of SEQ ID NO:262, residues 2-307 of SEQ
5 ID NO:265, residues 2-307 of SEQ ID NO:268, residues 2-
307 of SEQ ID NO:271, residues 2-307 of SEQ ID NO:274,
residues 2-307 of SEQ ID NO:277, residues 2-307 of SEQ
ID NO:280, residues 2-307 of SEQ ID NO:283, residues 2-
307 of SEQ ID NO:286, residues 2-307 of SEQ ID NO:289,
10 residues 2-307 of SEQ ID NO:292, residues 2-307 of SEQ
ID NO:295, residues 2-307 of SEQ ID NO:298, residues 2-
307 of SEQ ID NO:301, residues 2-307 of SEQ ID NO:304,
residues 2-307 of SEQ ID NO:307, residues 2-307 of SEQ
ID NO:310, residues 2-307 of SEQ ID NO:313, residues 2-
15 307 of SEQ ID NO:316, residues 2-307 of SEQ ID NO:319,
residues 2-307 of SEQ ID NO:322, residues 2-307 of SEQ
ID NO:325, residues 2-307 of SEQ ID NO:328, residues 2-
307 of SEQ ID NO:331, residues 2-307 of SEQ ID NO:334,
residues 2-307 of SEQ ID NO:337, residues 2-307 of SEQ
20 ID NO:340, residues 2-307 of SEQ ID NO:343, residues 2-
307 of SEQ ID NO:346, residues 2-307 of SEQ ID NO:349,
residues 2-307 of SEQ ID NO:352, residues 2-307 of SEQ
ID NO:355, residues 2-307 of SEQ ID NO:358, residues 2-
307 of SEQ ID NO:361, residues 2-307 of SEQ ID NO:364,
25 residues 2-307 of SEQ ID NO:367, residues 2-307 of SEQ
ID NO:370, residues 2-307 of SEQ ID NO:373, residues 2-
307 of SEQ ID NO:376, residues 2-307 of SEQ ID NO:379,
residues 2-307 of SEQ ID NO:382, residues 3-307 of SEQ
ID NO:178, residues 3-307 of SEQ ID NO:181, residues 3-
30 307 of SEQ ID NO:184, residues 3-307 of SEQ ID NO:187,
residues 3-307 of SEQ ID NO:190, residues 3-307 of SEQ
ID NO:193, residues 3-307 of SEQ ID NO:196, residues 3-
307 of SEQ ID NO:199, residues 3-307 of SEQ ID NO:202,
residues 3-307 of SEQ ID NO:205, residues 3-307 of SEQ
35 ID NO:208, residues 3-307 of SEQ ID NO:211, residues 3-

307 of SEQ ID NO:214, residues 3-307 of SEQ ID NO:217,
residues 3-307 of SEQ ID NO:220, residues 3-307 of SEQ
ID NO:223, residues 3-307 of SEQ ID NO:226, residues 3-
307 of SEQ ID NO:229, residues 3-307 of SEQ ID NO:232,
5 residues 3-307 of SEQ ID NO:235, residues 3-307 of SEQ
ID NO:238, residues 3-307 of SEQ ID NO:241, residues 3-
307 of SEQ ID NO:244, residues 3-307 of SEQ ID NO:247,
residues 3-307 of SEQ ID NO:250, residues 3-307 of SEQ
ID NO:253, residues 3-307 of SEQ ID NO:256, residues 3-
10 307 of SEQ ID NO:259, residues 3-307 of SEQ ID NO:262,
residues 3-307 of SEQ ID NO:265, residues 3-307 of SEQ
ID NO:268, residues 3-307 of SEQ ID NO:271, residues 3-
307 of SEQ ID NO:274, residues 3-307 of SEQ ID NO:277,
residues 3-307 of SEQ ID NO:280, residues 3-307 of SEQ
15 ID NO:283, residues 3-307 of SEQ ID NO:286, residues 3-
307 of SEQ ID NO:289, residues 3-307 of SEQ ID NO:292,
residues 3-307 of SEQ ID NO:295, residues 3-307 of SEQ
ID NO:298, residues 3-307 of SEQ ID NO:301, residues 3-
307 of SEQ ID NO:304, residues 3-307 of SEQ ID NO:307,
20 residues 3-307 of SEQ ID NO:310, residues 3-307 of SEQ
ID NO:313, residues 3-307 of SEQ ID NO:316, residues 3-
307 of SEQ ID NO:319, residues 3-307 of SEQ ID NO:322,
residues 3-307 of SEQ ID NO:325, residues 3-307 of SEQ
ID NO:328, residues 3-307 of SEQ ID NO:331, residues 3-
25 307 of SEQ ID NO:334, residues 3-307 of SEQ ID NO:337,
residues 3-307 of SEQ ID NO:340, residues 3-307 of SEQ
ID NO:343, residues 3-307 of SEQ ID NO:346, residues 3-
307 of SEQ ID NO:349, residues 3-307 of SEQ ID NO:352,
residues 3-307 of SEQ ID NO:355, residues 3-307 of SEQ
30 ID NO:358, residues 3-307 of SEQ ID NO:361, residues 3-
307 of SEQ ID NO:364, residues 3-307 of SEQ ID NO:367,
residues 3-307 of SEQ ID NO:370, residues 3-307 of SEQ
ID NO:373, residues 3-307 of SEQ ID NO:376, residues 3-
307 of SEQ ID NO:379, residues 3-307 of SEQ ID NO:382,
35 SEQ ID NO:179, SEQ ID NO:182, SEQ ID NO:185, SEQ ID

NO:188, SEQ ID NO:191, SEQ ID NO:194, SEQ ID NO:197, SEQ
ID NO:200, SEQ ID NO:203, SEQ ID NO:206, SEQ ID NO:209,
SEQ ID NO:212, SEQ ID NO:215, SEQ ID NO:218, SEQ ID
NO:221, SEQ ID NO:224, SEQ ID NO:227, SEQ ID NO:230, SEQ
5 ID NO:233, SEQ ID NO:236, SEQ ID NO:239, SEQ ID NO:242,
SEQ ID NO:245, SEQ ID NO:248, SEQ ID NO:251, SEQ ID
NO:254, SEQ ID NO:257, SEQ ID NO:260, SEQ ID NO:263, SEQ
ID NO:266, SEQ ID NO:269, SEQ ID NO:272, SEQ ID NO:275,
SEQ ID NO:278, SEQ ID NO:281, SEQ ID NO:284, SEQ ID
10 NO:287, SEQ ID NO:290, SEQ ID NO:293, SEQ ID NO:296, SEQ
ID NO:299, SEQ ID NO:302, SEQ ID NO:305, SEQ ID NO:308,
SEQ ID NO:311, SEQ ID NO:314, SEQ ID NO:317, SEQ ID
NO:320, SEQ ID NO:323, SEQ ID NO:326, SEQ ID NO:329, SEQ
ID NO:332, SEQ ID NO:335, SEQ ID NO:338, SEQ ID NO:341,
15 SEQ ID NO:344, SEQ ID NO:347, SEQ ID NO:350, SEQ ID
NO:353, SEQ ID NO:356, SEQ ID NO:359, SEQ ID NO:362, SEQ
ID NO:365, SEQ ID NO:368, SEQ ID NO:371, SEQ ID NO:374,
SEQ ID NO:377, SEQ ID NO:380, SEQ ID NO:383, residues 2-
322 of SEQ ID NO:179, residues 2-322 of SEQ ID NO:182,
20 residues 2-322 of SEQ ID NO:185, residues 2-322 of SEQ
ID NO:188, residues 2-322 of SEQ ID NO:191, residues 2-
322 of SEQ ID NO:194, residues 2-322 of SEQ ID NO:197,
residues 2-322 of SEQ ID NO:200, residues 2-322 of SEQ
ID NO:203, residues 2-322 of SEQ ID NO:206, residues 2-
25 322 of SEQ ID NO:209, residues 2-322 of SEQ ID NO:212,
residues 2-322 of SEQ ID NO:215, residues 2-322 of SEQ
ID NO:218, residues 2-322 of SEQ ID NO:221, residues 2-
322 of SEQ ID NO:224, residues 2-322 of SEQ ID NO:227,
residues 2-322 of SEQ ID NO:230, residues 2-322 of SEQ
30 ID NO:233, residues 2-322 of SEQ ID NO:236, residues 2-
322 of SEQ ID NO:239, residues 2-322 of SEQ ID NO:242,
residues 2-322 of SEQ ID NO:245, residues 2-322 of SEQ
ID NO:248, residues 2-322 of SEQ ID NO:251, residues 2-
322 of SEQ ID NO:254, residues 2-322 of SEQ ID NO:257,
35 residues 2-322 of SEQ ID NO:260, residues 2-322 of SEQ

ID NO:263, residues 2-322 of SEQ ID NO:266, residues 2-322 of SEQ ID NO:269, residues 2-322 of SEQ ID NO:272, residues 2-322 of SEQ ID NO:275, residues 2-322 of SEQ ID NO:278, residues 2-322 of SEQ ID NO:281, residues 2-322 of SEQ ID NO:284, residues 2-322 of SEQ ID NO:287, residues 2-322 of SEQ ID NO:290, residues 2-322 of SEQ ID NO:293, residues 2-322 of SEQ ID NO:296, residues 2-322 of SEQ ID NO:299, residues 2-322 of SEQ ID NO:302, residues 2-322 of SEQ ID NO:305, residues 2-322 of SEQ ID NO:308, residues 2-322 of SEQ ID NO:311, residues 2-322 of SEQ ID NO:314, residues 2-322 of SEQ ID NO:317, residues 2-322 of SEQ ID NO:320, residues 2-322 of SEQ ID NO:323, residues 2-322 of SEQ ID NO:326, residues 2-322 of SEQ ID NO:329, residues 2-322 of SEQ ID NO:332, residues 2-322 of SEQ ID NO:335, residues 2-322 of SEQ ID NO:338, residues 2-322 of SEQ ID NO:341, residues 2-322 of SEQ ID NO:344, residues 2-322 of SEQ ID NO:347, residues 2-322 of SEQ ID NO:350, residues 2-322 of SEQ ID NO:353, residues 2-322 of SEQ ID NO:356, residues 2-322 of SEQ ID NO:359, residues 2-322 of SEQ ID NO:362, residues 2-322 of SEQ ID NO:365, residues 2-322 of SEQ ID NO:368, residues 2-322 of SEQ ID NO:371, residues 2-322 of SEQ ID NO:374, residues 2-322 of SEQ ID NO:377, residues 2-322 of SEQ ID NO:380, residues 2-322 of SEQ ID NO:383, residues 3-322 of SEQ ID NO:179, residues 3-322 of SEQ ID NO:182, residues 3-322 of SEQ ID NO:185, residues 3-322 of SEQ ID NO:188, residues 3-322 of SEQ ID NO:191, residues 3-322 of SEQ ID NO:194, residues 3-322 of SEQ ID NO:197, residues 3-322 of SEQ ID NO:200, residues 3-322 of SEQ ID NO:203, residues 3-322 of SEQ ID NO:206, residues 3-322 of SEQ ID NO:209, residues 3-322 of SEQ ID NO:212, residues 3-322 of SEQ ID NO:215, residues 3-322 of SEQ ID NO:218, residues 3-322 of SEQ ID NO:221, residues 3-322 of SEQ ID NO:224, residues 3-322 of SEQ ID NO:227, residues 3-322 of SEQ ID NO:230,

residues 3-322 of SEQ ID NO:233, residues 3-322 of SEQ
ID NO:236, residues 3-322 of SEQ ID NO:239, residues 3-
322 of SEQ ID NO:242, residues 3-322 of SEQ ID NO:245,
residues 3-322 of SEQ ID NO:248, residues 3-322 of SEQ
5 ID NO:251, residues 3-322 of SEQ ID NO:254, residues 3-
322 of SEQ ID NO:257, residues 3-322 of SEQ ID NO:260,
residues 3-322 of SEQ ID NO:263, residues 3-322 of SEQ
ID NO:266, residues 3-322 of SEQ ID NO:269, residues 3-
322 of SEQ ID NO:272, residues 3-322 of SEQ ID NO:275,
10 residues 3-322 of SEQ ID NO:278, residues 3-322 of SEQ
ID NO:281, residues 3-322 of SEQ ID NO:284, residues 3-
322 of SEQ ID NO:287, residues 3-322 of SEQ ID NO:290,
residues 3-322 of SEQ ID NO:293, residues 3-322 of SEQ
ID NO:296, residues 3-322 of SEQ ID NO:299, residues 3-
15 322 of SEQ ID NO:302, residues 3-322 of SEQ ID NO:305,
residues 3-322 of SEQ ID NO:308, residues 3-322 of SEQ
ID NO:311, residues 3-322 of SEQ ID NO:314, residues 3-
322 of SEQ ID NO:317, residues 3-322 of SEQ ID NO:320,
residues 3-322 of SEQ ID NO:323, residues 3-322 of SEQ
20 ID NO:326, residues 3-322 of SEQ ID NO:329, residues 3-
322 of SEQ ID NO:332, residues 3-322 of SEQ ID NO:335,
residues 3-322 of SEQ ID NO:338, residues 3-322 of SEQ
ID NO:341, residues 3-322 of SEQ ID NO:344, residues 3-
322 of SEQ ID NO:347, residues 3-322 of SEQ ID NO:350,
25 residues 3-322 of SEQ ID NO:353, residues 3-322 of SEQ
ID NO:356, residues 3-322 of SEQ ID NO:359, residues 3-
322 of SEQ ID NO:362, residues 3-322 of SEQ ID NO:365,
residues 3-322 of SEQ ID NO:368, residues 3-322 of SEQ
ID NO:371, residues 3-322 of SEQ ID NO:374, residues 3-
30 322 of SEQ ID NO:377, residues 3-322 of SEQ ID NO:380,
residues 3-322 of SEQ ID NO:383, SEQ ID NO:180, SEQ ID
NO:183, SEQ ID NO:186, SEQ ID NO:189, SEQ ID NO:192, SEQ
ID NO:195, SEQ ID NO:198, SEQ ID NO:201, SEQ ID NO:204,
SEQ ID NO:207, SEQ ID NO:210, SEQ ID NO:213, SEQ ID
35 NO:216, SEQ ID NO:219, SEQ ID NO:222, SEQ ID NO:225, SEQ

ID NO:228, SEQ ID NO:231, SEQ ID NO:234, SEQ ID NO:237,
SEQ ID NO:240, SEQ ID NO:243, SEQ ID NO:246, SEQ ID
NO:249, SEQ ID NO:252, SEQ ID NO:255, SEQ ID NO:258, SEQ
ID NO:261, SEQ ID NO:264, SEQ ID NO:267, SEQ ID NO:270,
5 SEQ ID NO:273, SEQ ID NO:276, SEQ ID NO:279, SEQ ID
NO:282, SEQ ID NO:285, SEQ ID NO:288, SEQ ID NO:291, SEQ
ID NO:294, SEQ ID NO:297, SEQ ID NO:300, SEQ ID NO:303,
SEQ ID NO:306, SEQ ID NO:309, SEQ ID NO:312, SEQ ID
NO:315, SEQ ID NO:318, SEQ ID NO:321, SEQ ID NO:324, SEQ
10 ID NO:327, SEQ ID NO:330, SEQ ID NO:333, SEQ ID NO:336,
SEQ ID NO:339, SEQ ID NO:342, SEQ ID NO:345, SEQ ID
NO:348, SEQ ID NO:351, SEQ ID NO:354, SEQ ID NO:357, SEQ
ID NO:360, SEQ ID NO:363, SEQ ID NO:366, SEQ ID NO:369,
SEQ ID NO:372, SEQ ID NO:375, SEQ ID NO:378, SEQ ID
15 NO:381, SEQ ID NO:384, residues 2-349 of SEQ ID NO:179,
residues 2-349 of SEQ ID NO:182, residues 2-349 of SEQ
ID NO:185, residues 2-349 of SEQ ID NO:188, residues 2-
349 of SEQ ID NO:191, residues 2-349 of SEQ ID NO:194,
residues 2-349 of SEQ ID NO:197, residues 2-349 of SEQ
20 ID NO:200, residues 2-349 of SEQ ID NO:203, residues 2-
349 of SEQ ID NO:206, residues 2-349 of SEQ ID NO:209,
residues 2-349 of SEQ ID NO:212, residues 2-349 of SEQ
ID NO:215, residues 2-349 of SEQ ID NO:218, residues 2-
349 of SEQ ID NO:221, residues 2-349 of SEQ ID NO:224,
25 residues 2-349 of SEQ ID NO:227, residues 2-349 of SEQ
ID NO:230, residues 2-349 of SEQ ID NO:233, residues 2-
349 of SEQ ID NO:236, residues 2-349 of SEQ ID NO:239,
residues 2-349 of SEQ ID NO:242, residues 2-349 of SEQ
ID NO:245, residues 2-349 of SEQ ID NO:248, residues 2-
30 349 of SEQ ID NO:251, residues 2-349 of SEQ ID NO:254,
residues 2-349 of SEQ ID NO:257, residues 2-349 of SEQ
ID NO:260, residues 2-349 of SEQ ID NO:263, residues 2-
349 of SEQ ID NO:266, residues 2-349 of SEQ ID NO:269,
residues 2-349 of SEQ ID NO:272, residues 2-349 of SEQ
35 ID NO:275, residues 2-349 of SEQ ID NO:278, residues 2-

349 of SEQ ID NO:281, residues 2-349 of SEQ ID NO:284,
residues 2-349 of SEQ ID NO:287, residues 2-349 of SEQ
ID NO:290, residues 2-349 of SEQ ID NO:293, residues 2-
349 of SEQ ID NO:296, residues 2-349 of SEQ ID NO:299,
5 residues 2-349 of SEQ ID NO:302, residues 2-349 of SEQ
ID NO:305, residues 2-349 of SEQ ID NO:308, residues 2-
349 of SEQ ID NO:311, residues 2-349 of SEQ ID NO:314,
residues 2-349 of SEQ ID NO:317, residues 2-349 of SEQ
ID NO:320, residues 2-349 of SEQ ID NO:323, residues 2-
10 349 of SEQ ID NO:326, residues 2-349 of SEQ ID NO:329,
residues 2-349 of SEQ ID NO:332, residues 2-349 of SEQ
ID NO:335, residues 2-349 of SEQ ID NO:338, residues 2-
349 of SEQ ID NO:341, residues 2-349 of SEQ ID NO:344,
residues 2-349 of SEQ ID NO:347, residues 2-349 of SEQ
15 ID NO:350, residues 2-349 of SEQ ID NO:353, residues 2-
349 of SEQ ID NO:356, residues 2-349 of SEQ ID NO:359,
residues 2-349 of SEQ ID NO:362, residues 2-349 of SEQ
ID NO:365, residues 2-349 of SEQ ID NO:368, residues 2-
349 of SEQ ID NO:371, residues 2-349 of SEQ ID NO:374,
20 residues 2-349 of SEQ ID NO:377, residues 2-349 of SEQ
ID NO:380, residues 2-349 of SEQ ID NO:383, residues 3-
349 of SEQ ID NO:179, residues 2-349 of SEQ ID NO:182,
residues 2-349 of SEQ ID NO:185, residues 2-349 of SEQ
ID NO:188, residues 2-349 of SEQ ID NO:191, residues 2-
25 349 of SEQ ID NO:194, residues 2-349 of SEQ ID NO:197,
residues 2-349 of SEQ ID NO:200, residues 2-349 of SEQ
ID NO:203, residues 2-349 of SEQ ID NO:206, residues 2-
349 of SEQ ID NO:209, residues 2-349 of SEQ ID NO:212,
residues 2-349 of SEQ ID NO:215, residues 2-349 of SEQ
30 ID NO:218, residues 2-349 of SEQ ID NO:221, residues 2-
349 of SEQ ID NO:224, residues 2-349 of SEQ ID NO:227,
residues 2-349 of SEQ ID NO:230, residues 2-349 of SEQ
ID NO:233, residues 2-349 of SEQ ID NO:236, residues 2-
349 of SEQ ID NO:239, residues 2-349 of SEQ ID NO:242,
35 residues 2-349 of SEQ ID NO:245, residues 2-349 of SEQ

5 ID NO:248, residues 2-349 of SEQ ID NO:251, residues 2-349 of SEQ ID NO:254, residues 2-349 of SEQ ID NO:257, residues 2-349 of SEQ ID NO:260, residues 2-349 of SEQ ID NO:263, residues 2-349 of SEQ ID NO:266, residues 2-349 of SEQ ID NO:269, residues 2-349 of SEQ ID NO:272, residues 2-349 of SEQ ID NO:275, residues 2-349 of SEQ ID NO:278, residues 2-349 of SEQ ID NO:281, residues 2-349 of SEQ ID NO:284, residues 2-349 of SEQ ID NO:287, residues 2-349 of SEQ ID NO:290, residues 2-349 of SEQ ID NO:293, residues 2-349 of SEQ ID NO:296, residues 2-349 of SEQ ID NO:299, residues 2-349 of SEQ ID NO:302, residues 2-349 of SEQ ID NO:305, residues 2-349 of SEQ ID NO:308, residues 2-349 of SEQ ID NO:311, residues 2-349 of SEQ ID NO:314, residues 2-349 of SEQ ID NO:317, residues 2-349 of SEQ ID NO:320, residues 2-349 of SEQ ID NO:323, residues 2-349 of SEQ ID NO:326, residues 2-349 of SEQ ID NO:329, residues 2-349 of SEQ ID NO:332, residues 2-349 of SEQ ID NO:335, residues 2-349 of SEQ ID NO:338, residues 2-349 of SEQ ID NO:341, residues 2-349 of SEQ ID NO:344, residues 2-349 of SEQ ID NO:347, residues 2-349 of SEQ ID NO:350, residues 2-349 of SEQ ID NO:353, residues 2-349 of SEQ ID NO:356, residues 2-349 of SEQ ID NO:359, residues 2-349 of SEQ ID NO:362, residues 2-349 of SEQ ID NO:365, residues 2-349 of SEQ ID NO:368, residues 2-349 of SEQ ID NO:371, residues 2-349 of SEQ ID NO:374, residues 2-349 of SEQ ID NO:377, residues 2-349 of SEQ ID NO:380, and residues 2-349 of SEQ ID NO:383.

30 6. The Myelopoietin conjugate of claim 1 wherein said Myelopoietin polypeptide is selected from the group consisting of: SEQ ID NO:224, residues 2-322 of SEQ ID NO:224, and residues 3-322 of SEQ ID NO:224.

7. The Myelopoietin conjugate of claim 1, 2, 3, 4, 5 or 6 wherein said polymer is a poly(ethylene oxide) molecule.

5 8. The Myelopoietin conjugate of claim 7 wherein said poly(ethylene oxide) molecule is a poly(ethylene glycol) molecule.

9. The Myelopoietin conjugate of claim
10 8 wherein the poly(ethylene glycol) is attached at an amino acid residue having a free amino, carboxyl or sulfhydryl group(s).

10. The Myelopoietin conjugate of claim 9 wherein
15 said poly(ethylene glycol) is conjugated through a activated poly(ethylene glycol).

11. The Myelopoietin conjugate of claim 10 wherein
said activated poly(ethylene glycol) is selected from
20 the group consisting of, para-nitrophenyl, succinimidyl, carbonyl imidazole, azlactones, cyclic imide thiones, isocyanates, isothiocyanates, aldehydes, primary amines, hydrazine, acyl hydrazides, carbazates, semicarbamates, thiocarbazates, thiols, maleimides, sulfones, and phenyl
25 glyoxals.

12. The Myelopoietin conjugate of claim 11 wherein
said activated poly(ethylene glycol) is selected from
the group consisting of, succinimidyl, carbonyl
30 imidazole, aldehydes, acyl hydrazides, carbazates, semicarbamates, and maleimides.

13. The Myelopoietin conjugate of claim 9 wherein
said poly(ethylene glycol) has a molecular weight of
35 between about 0.5 kDa and about 100 kDa.

14. The Myelopoietin conjugate of claim 9 wherein said poly(ethylene glycol) has a molecular weight of between about 3.4 kDa and about 40 kDa.

5

15. The Myelopoietin conjugate of claim 9 wherein said poly(ethylene glycol) is a branched polymer.

16. The Myelopoietin conjugate of claim 15 wherein
10 branched poly(ethylene glycol) polymer has a molecular weight of between about 10 kDa and about 40 kDa.

17. The Myelopoietin conjugate of claim 9 wherein
15 said poly(ethylene glycol) is a bifunctional polymer.

18. The Myelopoietin conjugate of claim 1, 2, 3,
4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, or 17
wherein said Myelopoietin conjugate is a prodrug.

19. A composition comprising the Myelopoietin of
20 claim 1, 2, 3, 4, 5, 6, 7, 8, or 9 and at least one pharmaceutically acceptable carrier.

20. A composition comprising the Myelopoietin of
25 claim 10 and at least one pharmaceutically acceptable carrier.

21. A composition comprising the Myelopoietin of
claim 11, 12, 13, 14, 15, 16, 17, or 18 and at least one
30 pharmaceutically acceptable carrier.

22. A method of treating a patient having a
hematopoietic disorder comprising administering to said
patient a therapeutically effective amount of the

Myelopoietin conjugate of claim 1, 2, 3, 4, 5, 6, 7, 8, or 9.

23. A method of treating a patient having a
5 hematopoietic disorder comprising administering to said patient a therapeutically effective amount of the Myelopoietin conjugate of claim 10.

24. A method of treating a patient having a
10 hematopoietic disorder comprising administering to said patient a therapeutically effective amount of the Myelopoietin conjugate of claim 11, 12, 13, 14, 15, 16, 17, or 18.

15 25. The method of claim 22 wherein said hematopoietic disorder is neutropenia, leukopenia, thrombocytopenia, or anemia.

26. The method of claim 23 wherein said
20 hematopoietic disorder is neutropenia, leukopenia, thrombocytopenia, or anemia.

27. The method of claim 24 wherein said
25 hematopoietic disorder is neutropenia, leukopenia, thrombocytopenia, or anemia.

28. The method of claim 22 wherein said
hematopoietic disorder is the result of chemotherapy,
radiation therapy, or bone marrow suppressive drugs.
30

29. The method of claim 23 wherein said
hematopoietic disorder is the result of chemotherapy,
radiation therapy, or bone marrow suppressive drugs.

35 30. The method of claim 24 wherein said hematopoietic disorder is the result of chemotherapy, radiation therapy, or bone marrow suppressive drugs.

31. A method of treating a patient recovering
and/or suffering from a bone marrow transplant, burn,
wound, parasite, bacterial or viral infection comprising
5 administering to said patient a therapeutically
effective amount of the Myelopoietin conjugate of claim
1, 2, 3, 4, 5, 6, 7, 8, or 9.

32. A method of treating a patient recovering
10 and/or suffering from a bone marrow transplant, burn,
wound, parasite, bacterial or viral infection comprising
administering to said patient a therapeutically
effective amount of the Myelopoietin conjugate of claim
10.

15 33. A method of treating a patient recovering
and/or suffering from a bone marrow transplant, burn,
wound, parasite, bacterial or viral infection comprising
administering to said patient a therapeutically
20 effective amount of the Myelopoietin conjugate of claim
11, 12, 13, 14, 15, 16, 17, or 18.

34. A method of mobilizing hematopoietic
progenitors and stem cells into peripheral blood
25 comprising administering to said patient a
therapeutically effective amount of the Myelopoietin
conjugate of claim 1, 2, 3, 4, 5, 6, 7, 8, or 9.

35. A method of mobilizing hematopoietic
30 progenitors and stem cells into peripheral blood
comprising administering to said patient a
therapeutically effective amount of the Myelopoietin
conjugate of claim 10.

36. A method of mobilizing hematopoietic
progenitors and stem cells into peripheral blood
comprising administering to said patient a
therapeutically effective amount of the Myelopoietin
5 conjugate of claim 11, 12, 13, 14, 15, 16, 17, or 18.

FIG 1

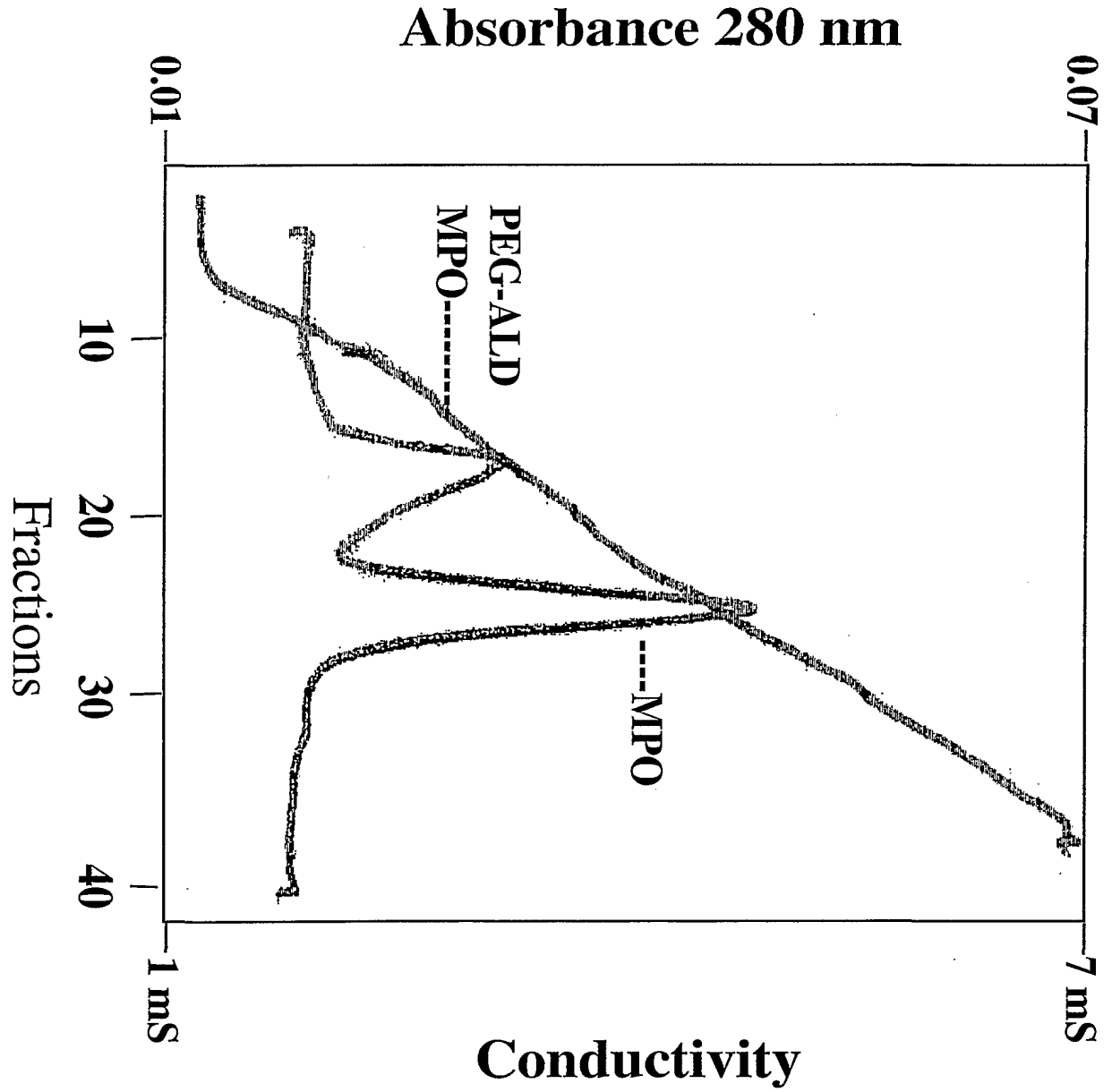
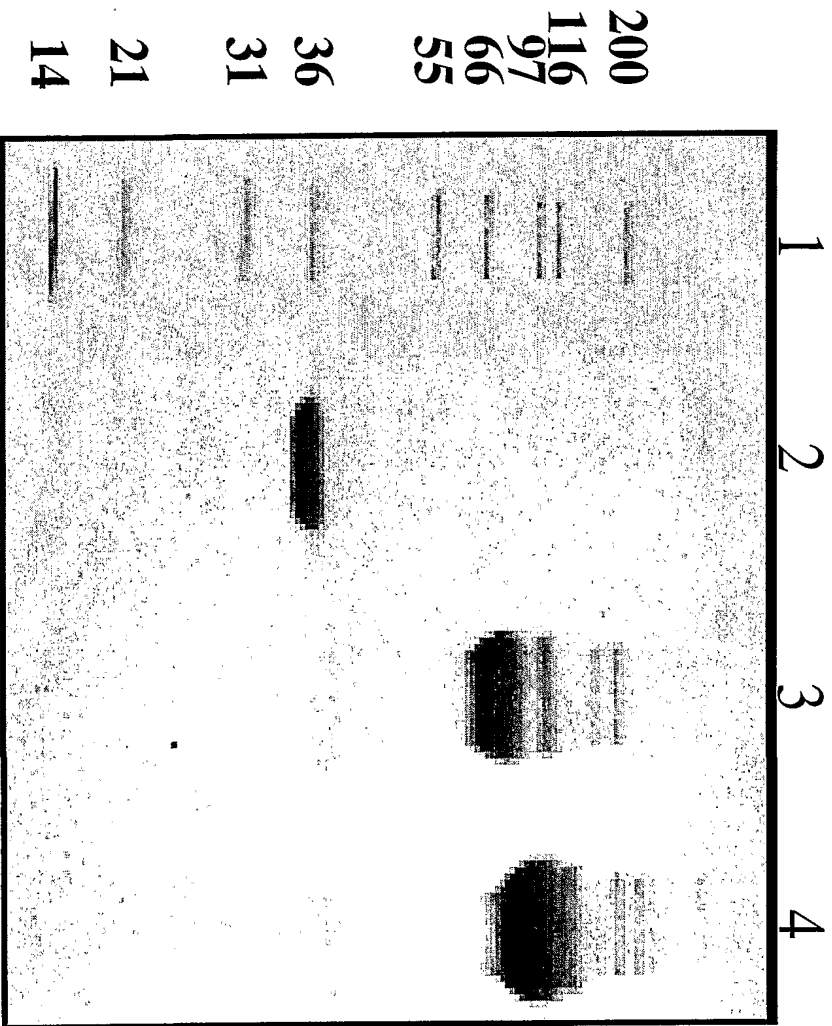
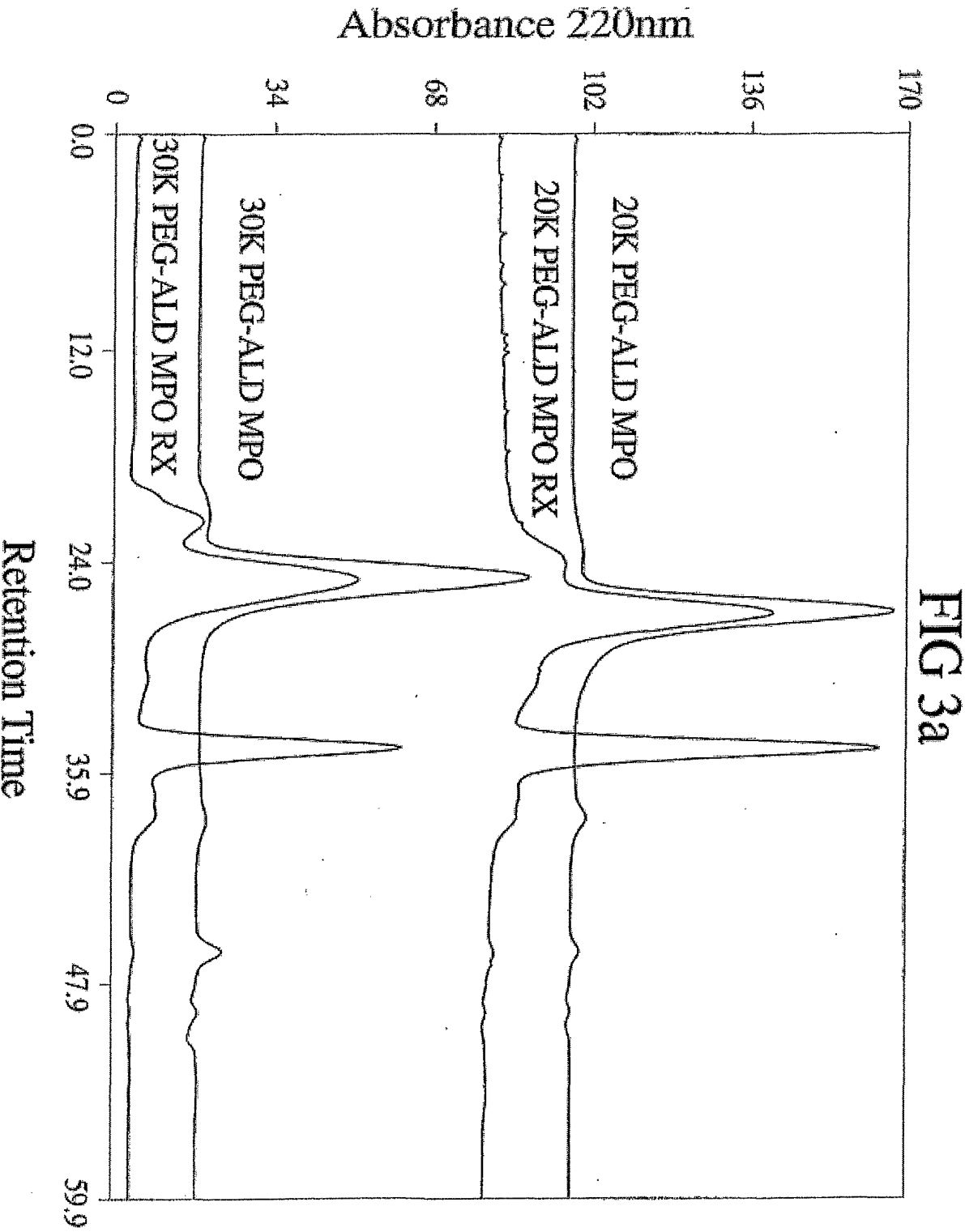


FIG 2



1. MW Markers
 2. MPO
 3. 20K PEG-ALD MPO
 4. 30K PEG-ALD MPO
- 2/8



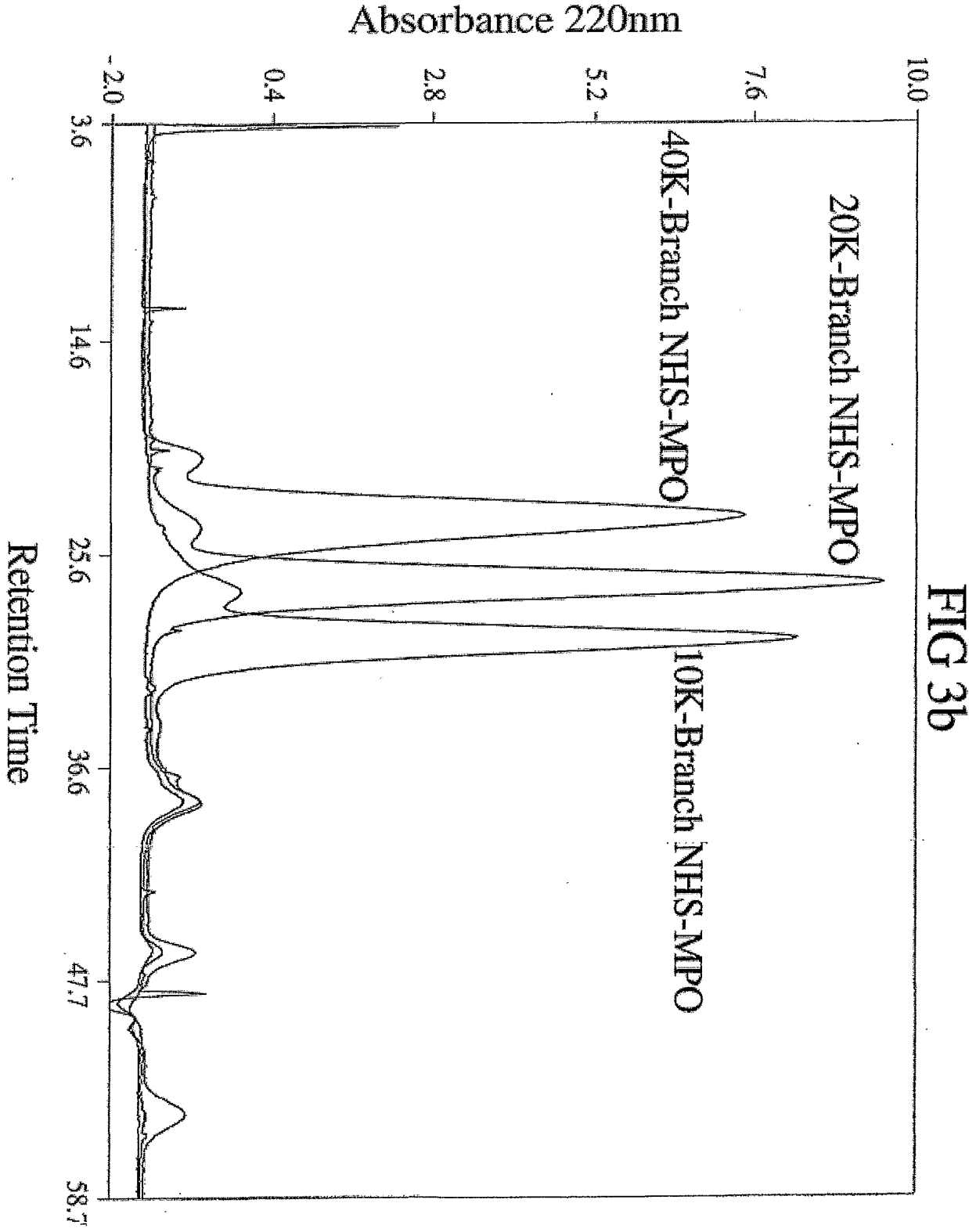


FIG 4

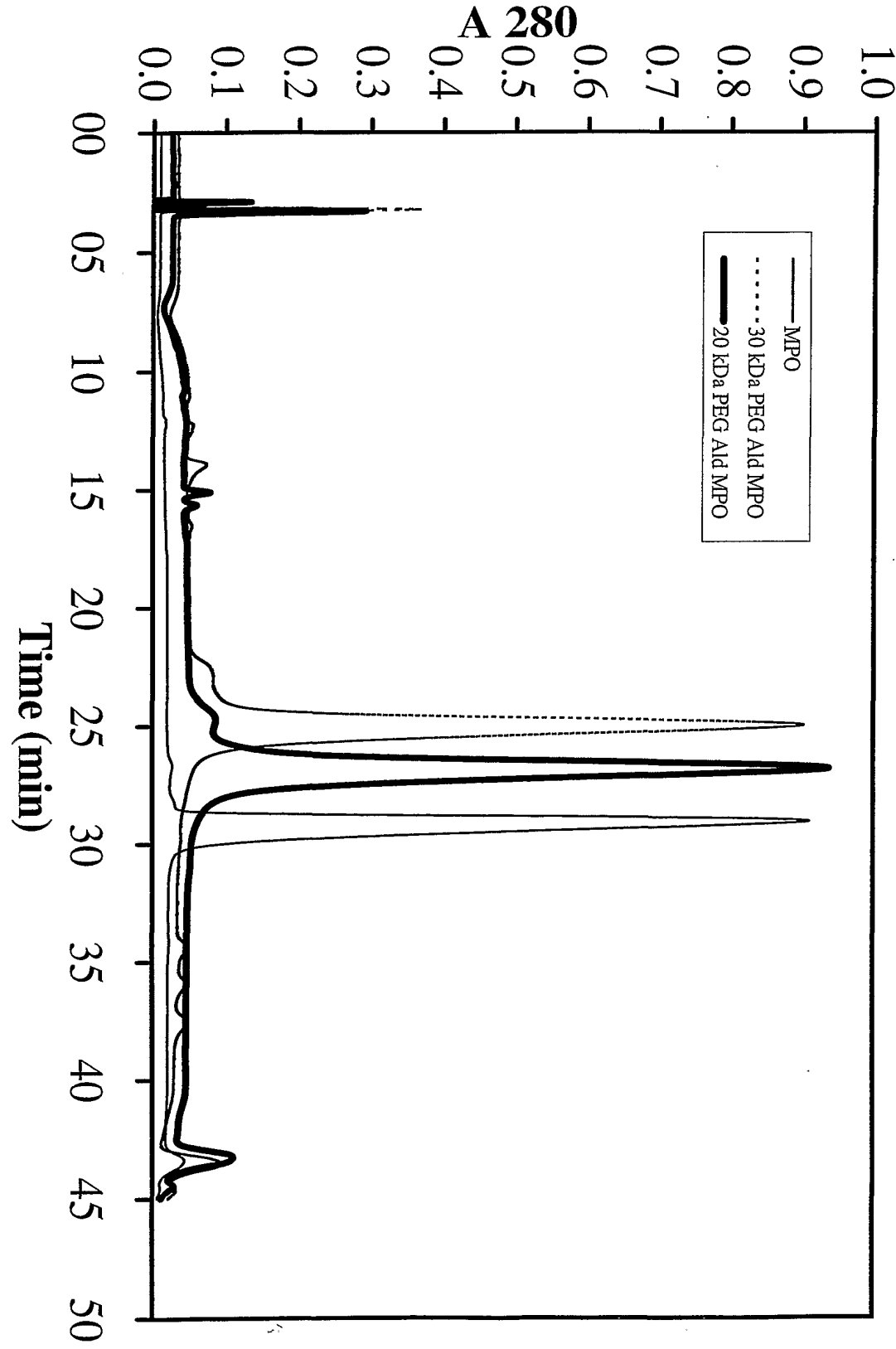


FIG 5

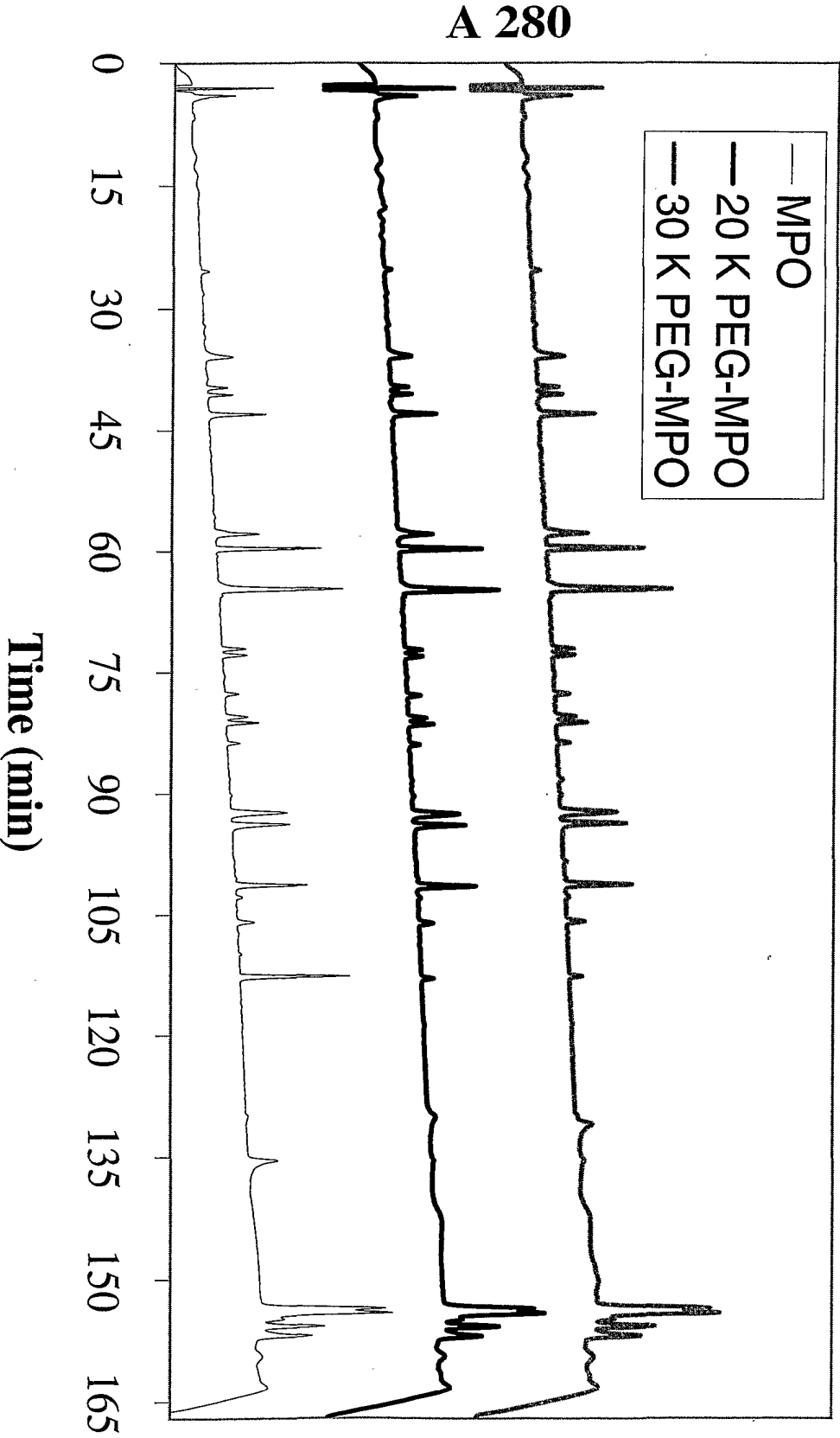


FIG 6

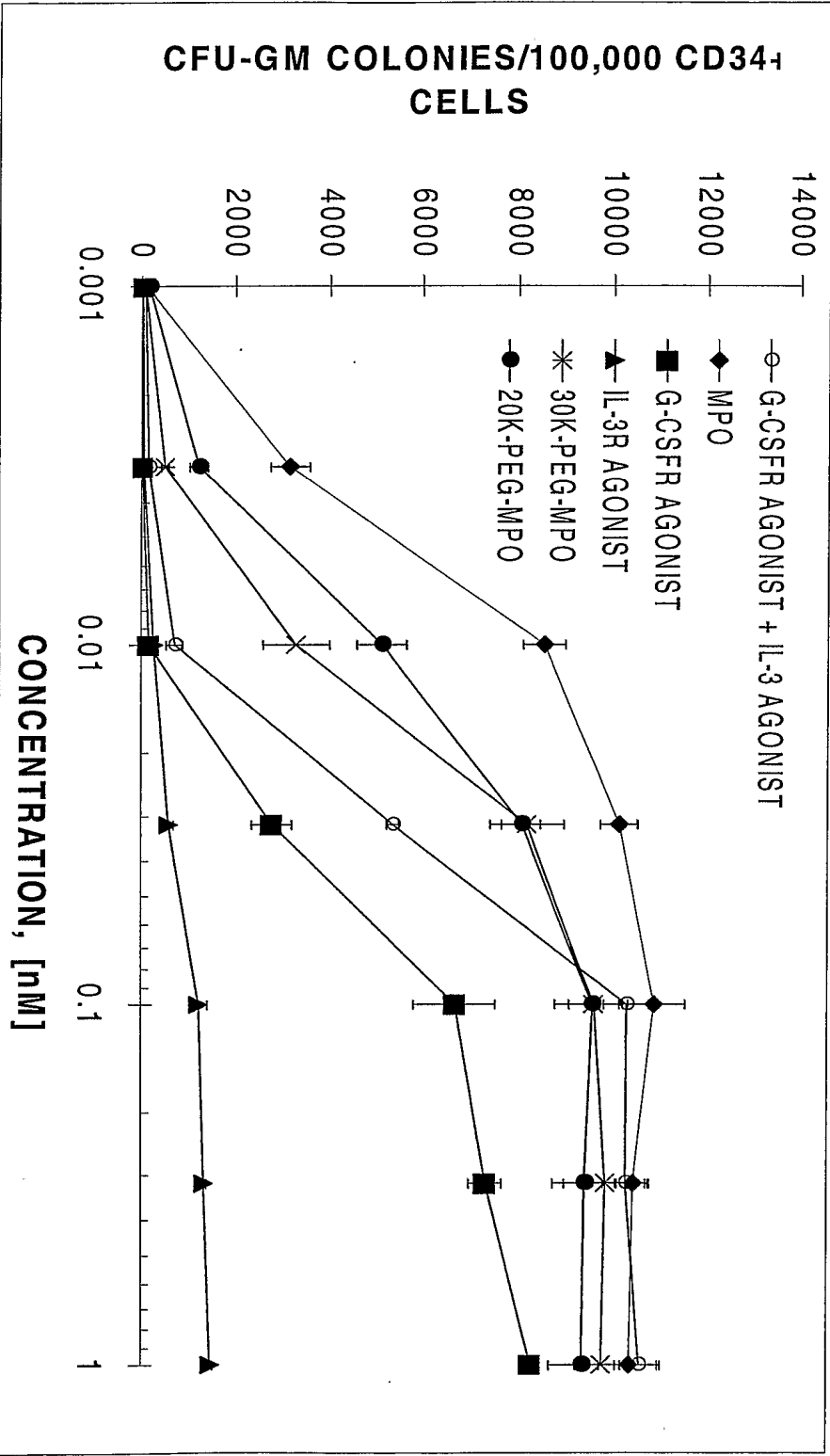
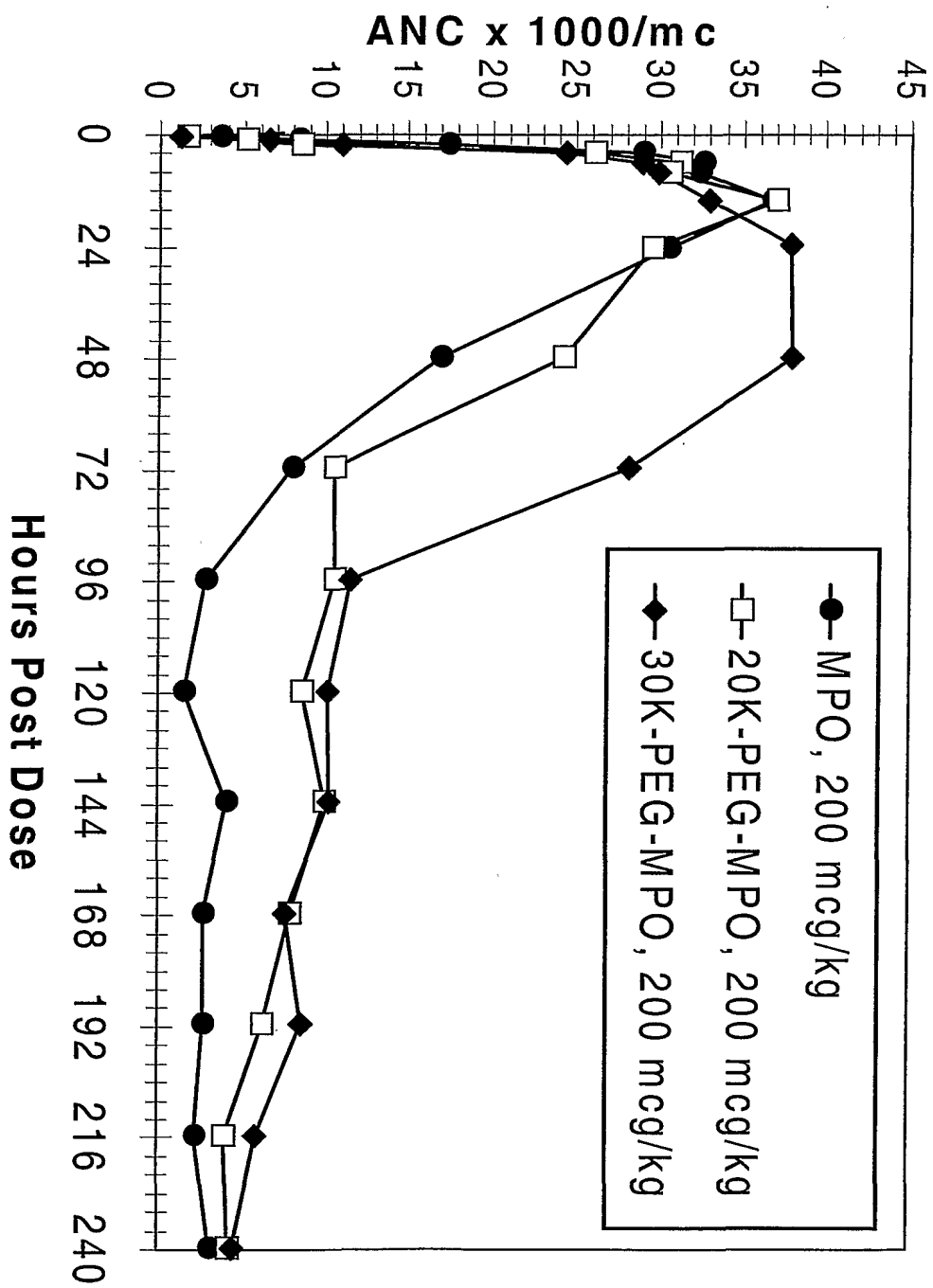


FIG 7



SEQUENCE LISTING

<110> Pharmacia
Rory F. Finn
Kurt Sedo
Yatin Gokarn
Peter Nicastro
Walter G. Smith
Hong Qi
Robert Hills
Ned Siegel

<120> TITLE OF INVENTION Chemically Modified Myelopoietin Conjugates

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Val, Arg, Gln, Asn, Gly, Ala, or Glu"

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Val, Gly, Ser, Lys, Glu, Gln, Thr, Arg, Ala, Phe,
Ile, or Met"

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or Pro"

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Pro, Phe, Val, Met, Leu, Thr, Lys, Trp, Asp, Asn, Arg,
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Ile, Val, or Gly"

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Ala, Gly, Ile, Leu, or Gln"

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Ser, Ala, Lys, Thr, Ile, Gly, or Pro"

<220>
<221> MUTAGEN
<222> 108
<223> /note= "Xaa at position 108 is Arg,
Lys, Asp, Leu, Thr, Ile, Gln, His, Ser, Ala, or Pro"

<220>
<221> MUTAGEN
<222> 109
<223> /note= "Xaa at position 109 is Arg,
Thr, Pro, Glu, Tyr, Leu, Ser, or Gly"

<220>
<221> MUTAGEN
<222> 110
<223> /note= "Xaa at position 110 is Lys,

Ala, Asn, Thr, Leu, Arg, Gln, His, Glu, Ser, Ala,
or Trp"

<220>
<221> MUTAGEN
<222> 111
<223> /note= "Xaa at position 111 is Leu,
Ile, Arg, Asp, or Met"

<220>
<221> MUTAGEN
<222> 112
<223> /note= "Xaa at position 112 is Thr,
Val, Gln, Tyr, Glu, His, Ser, or Phe"

<220>
<221> MUTAGEN
<222> 113
<223> /note= "Xaa at position 113 is Phe,
Ser, Cys, His, Gly, Trp, Tyr, Asp, Lys, Leu, Ile, Val,
or Asn"

<220>
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<222> 114
<223> /note= "Xaa at position 114 is Tyr,
Cys, His, Ser, Trp, Arg, or Leu"

<220>
<221> MUTAGEN
<222> 115
<223> /note= "Xaa at position 115 is
Leu, Asn, Val, Pro, Arg, Ala, His, Thr, Trp, or
Met"

<220>
<221> MUTAGEN
<222> 116
<223> /note= "Xaa at position 116 is Lys,
Leu, Pro, Thr, Met, Asp, Val, Glu, Arg, Trp, Ser,
Asn, His, Ala, Tyr, Phe, Gln, or Ile"

<220>
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<222> 117
<223> /note= "Xaa at position 117 is Thr,
Ser, Asn, Ile, Trp, Lys, or Pro"

<220>
<221> MUTAGEN
<222> 118
<223> /note= "Xaa at position 118 is Leu,
Ser, Pro, Ala, Glu, Cys, Asp, or Tyr"

<220>
<221> MUTAGEN
<222> 119
<223> /note= "Xaa at position 119 is Glu,
Ser, Lys, Pro, Leu, Thr, Tyr, or Arg"

<220>
<221> MUTAGEN
<222> 120
<223> /note= "Xaa at position 120 is Asn,
Ala, Pro, Leu, His, Val, or Gln"

<220>
<221> MUTAGEN
<222> 121
<223> /note= "Xaa at position 121 is Ala,
Ser, Ile, Asn, Pro, Lys, Asp, or Gly"

<220>
<221> MUTAGEN
<222> 122
<223> /note= "Xaa at position 122 is

Gln, Ser, Met, Trp, Arg, Phe, Pro, His, Ile, Tyr,
or Cys"

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<220>
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<222>    123
<223>    /note= "Xaa at position 123 is Ala,
              Met, Glu, His, Ser, Pro, Tyr, or Leu"

<400>      1

Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn Cys
1              5              10              15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
      20              25              30

Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
      35              40              45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
      50              55              60

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
      65              70              75              80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
      85              90              95

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Phe Xaa Xaa Xaa Xaa Xaa
      100             105             110

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gln Gln Thr Thr Leu
      115             120             125

Ser Leu Ala Ile Phe
      130

<210>      2
<211>      133
<212>      PRT
<213>      Artificial Sequence

<220>
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<223>    /note= "Met- may or may not precede
              the amino acid in position 1"

<220>
<221>    MUTAGEN
<222>      17
<223>    /note= "Xaa at position 17 is Ser,
              Gly, Asp, Met, or Gln"

<220>
<221>    MUTAGEN
<222>      18
<223>    /note= "Xaa at position 18 is Asn,
              His, or Ile"

<220>
<221>    MUTAGEN
<222>      19
<223>    /note= "Xaa at position 19 is Met
              or Ile"

<220>
<221>    MUTAGEN
<222>      21
<223>    /note="Xaa at position 21 is Asp
              or Glu"

<220>
<221>    MUTAGEN
<222>      23

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<223> /note= "Xaa at position 23 is Ile,
Ala, Leu, or Gly"

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<221> MUTAGEN
<222> 24
<223> /note= "Xaa at position 24 is Ile,
Val, or Leu"

<220>
<221> MUTAGEN
<222> 25
<223> /note= "Xaa at position 25 is Thr,
His, Gln, or Ala"

<220>
<221> MUTAGEN
<222> 26
<223> /note= "Xaa at position 26 is His
or Ala"

<220>
<221> MUTAGEN
<222> 29
<223> /note= "Xaa at position 29 is Gln,
Asn, or Val"

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<221> MUTAGEN
<222> 30
<223> /note= "Xaa at position 30 is Pro,
Gly, or Gln"

<220>
<221> MUTAGEN
<222> 31
<223> /note= "Xaa at position 31 is Pro,
Asp, Gly, or Gln"

<220>
<221> MUTAGEN
<222> 32
<223> /note= "Xaa at position 32 is Leu,
Arg, Gln, Asn, Gly, Ala, or Glu"

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<221> MUTAGEN
<222> 33
<223> /note= "Xaa at position 33 is Pro
or Glu"

<220>
<221> MUTAGEN
<222> 34
<223> /note= "Xaa at position 34 is Leu,
Val, Gly, Ser, Lys, Ala, Arg, Gln, Glu, Ile, Phe,
Thr, or Met"

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<222> 35
<223> /note= "Xaa at position 35 is Leu,
Ala, Asn, Pro, Gln, or Val"

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<221> MUTAGEN
<222> 37
<223> /note= "Xaa at position 37 is Phe,
Ser, Pro, or Trp"

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<221> MUTAGEN
<222> 38
<223> /note="Xaa at position 38 is Asn
or Ala"

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<222> 42
<223> /note= "Xaa at position 42 is Gly,
Asp, Ser, Cys, Ala, Asn, Ile, Leu, Met, Tyr,
or Arg"

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<222> 44
<223> /note="Xaa at position 44 is Asp
or Glu"

<220>
<221> MUTAGEN
<222> 45
<223> /note= "Xaa at position 45 is Gln,
Val, Met, Leu, Thr, Ala, Asn, Glu, Ser, or Lys"

<220>
<221> MUTAGEN
<222> 46
<223> /note= "Xaa at position 46 is Asp,
Phe, Ser, Thr, Ala, Asn, Gln, Glu, His, Ile,
Lys, Tyr, Val, or Cys"

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<222> 50
<223> /note= "Xaa at position 50 is Glu,
Ala, Asn, Ser, or Asp"

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<222> 51
<223> /note= "Xaa at position 51 is Asn,
Arg, Met, Pro, Ser, Thr, or His"

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<222> 54
<223> /note="Xaa at position 54 is Arg
or Ala"

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<221> MUTAGEN
<222> 55
<223> /note= "Xaa at position 55 is Arg,
Thr, Val, Leu, or Gly"

<220>
<221> MUTAGEN
<222> 56
<223> /note= "Xaa at position 56 is Pro,
Gly, Ser, Gln, Ala, Arg, Asn, Glu, Leu, Thr, Val,
or Lys"

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<222> 60
<223> /note= "Xaa at position 60 is Ala
or Ser"

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<222> 62
<223> /note= "Xaa at position 62 is Asn,
Pro, Thr, or Ile"

<220>
<221> MUTAGEN
<222> 63
<223> /note= "Xaa at position 63 is Arg
or Lys"

<220>

<221> MUTAGEN
<222> 64
<223> /note= "Xaa at position 64 is Ala
or Asn"

<220>
<221> MUTAGEN
<222> 65
<223> /note= "Xaa at position 65 is Val
or Thr"

<220>
<221> MUTAGEN
<222> 66
<223> /note= "Xaa at position 66 is Lys
or Arg"

<220>
<221> MUTAGEN
<222> 67
<223> /note= "Xaa at position 67 is Ser
Phe or His"

<220>
<221> MUTAGEN
<222> 68
<223> /note= "Xaa at position 68 is Leu,
Ile, Phe, or His"

<220>
<221> MUTAGEN
<222> 69
<223> /note= "Xaa at position 69 is Gln,
Ala, Pro, Thr, Glu, Arg, or Gly"

<220>
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<222> 71
<223> /note= "Xaa at position 71 is Ala,
Pro, or Arg"

<220>
<221> MUTAGEN
<222> 72
<223> /note= "Xaa at position 72 is Ser,
Glu, Arg, or Asp"

<220>
<221> MUTAGEN
<222> 73
<223> /note= "Xaa at position 73 is Ala
or Leu"

<220>
<221> MUTAGEN
<222> 76
<223> /note= "Xaa at position 76 is Ser,
Val, Ala, Asn, Glu, Pro, or Gly"

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<221> MUTAGEN
<222> 77
<223> /note= "Xaa at position 77 is Ile
or Leu"

<220>
<221> MUTAGEN
<222> 79
<223> /note= "Xaa at position 79 is
Lys, Thr, Gly, Asn, Met, Arg, Ile, Gly, or Asp"

<220>
<221> MUTAGEN
<222> 80
<223> /note= "Xaa at position 80 is Asn,
Gly, Glu, or Arg"

<220>
<221> MUTAGEN
<222> 82
<223> /note= "Xaa at position 82 is Leu,
Gln, Trp, Arg, Asp, Ala, Asn, Glu, His, Ile,
Met, Phe, Ser, Thr, Tyr, or Val"

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<222> 83
<223> /note= "Xaa at position 83 is Pro
or Thr"

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<222> 85
<223> /note= "Xaa at position 85 is Leu
or Val"

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<221> MUTAGEN
<222> 87
<223> /note= "Xaa at position 87 is Leu
or Ser"

<220>
<221> MUTAGEN
<222> 88
<223> /note= "Xaa at position 88 is Ala
or Trp"

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<222> 91
<223> /note= "Xaa at position 91 is Ala
or Pro"

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<222> 93
<223> /note= "Xaa at position 93 is Thr,
Asp, Ser, Pro, Ala, Leu, or Arg"

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<222> 95
<223> /note= "Xaa at position 95 is His,
Pro, Arg, Val, Leu, Gly, Asn, Phe, Ser, or Thr"

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<221> MUTAGEN
<222> 96
<223> /note= "Xaa at position 96 is Pro
or Tyr"

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<221> MUTAGEN
<222> 97
<223> /note= "Xaa at position 97 is Ile
or Val"

<220>
<221> MUTAGEN
<222> 98
<223> /note= "Xaa at position 98 is His,
Ile, Asn, Leu, Ala, Thr, Arg, Gln, Lys,
Met, Ser, Tyr, Val, or Pro"

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<222> 99
<223> /note= "Xaa at position 99 is Ile,
Leu, or Val"

<220>

<221> MUTAGEN
<222> 100
<223> /note= "Xaa at position 100 is Lys,
Arg, Ile, Gln, Pro, or Ser"

<220>
<221> MUTAGEN
<222> 101
<223> /note= "Xaa at position 101 is Asp,
Pro, Met, Lys, Thr, His, Asn, Ile, Leu, or Tyr"

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<221> MUTAGEN
<222> 104
<223> /note= "Xaa at position 104 is Trp
or Leu"

<220>
<221> MUTAGEN
<222> 105
<223> /note= "Xaa at position 105 is
Asn, Pro, Ala, Ser, Trp, Gln, Tyr, Leu, Lys, Ile,
Asp, or His"

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<221> MUTAGEN
<222> 106
<223> /note= "Xaa at position 106 is Glu
or Gly"

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<221> MUTAGEN
<222> 108
<223> /note="Xaa at position 108 is Arg,
Ala, or Ser"

<220>
<221> MUTAGEN
<222> 109
<223> /note= "Xaa at position 109 is Arg,
Thr, Glu, Leu, or Ser"

<220>
<221> MUTAGEN
<222> 112
<223> /note= "Xaa at position 112 is Thr,
Val, or Gln"

<220>
<221> MUTAGEN
<222> 114
<223> /note= "Xaa at position 114 is Tyr
or Trp"

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<221> MUTAGEN
<222> 115
<223> /note= "Xaa at position 115 is Leu
or Ala"

<220>
<221> MUTAGEN
<222> 116
<223> /note= "Xaa at position 116 is Lys,
Thr, Val, Trp, Ser, Ala, His, Met, Phe, Tyr, or Ile"

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<221> MUTAGEN
<222> 117
<223> /note= "Xaa at position 117 is Thr
or Ser"

<220>
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<222> 120
<223> /note= "Xaa at position 120 is Asn,

Pro, Leu, His, Val, or Gln"

<220>

<221> MUTAGEN

<222> 121

<223> /note= "Xaa at position 121 is Ala,
Ser, Ile, Asn, Pro, Asp, or Gly"

<220>

<221> MUTAGEN

<222> 122

<223> /note= "Xaa at position 122 is
Gln, Ser, Met, Trp, Arg, Phe, Pro, His, Ile, Tyr,
or Cys"

<220>

<221> MUTAGEN

<222> 123

<223> /note= "Xaa at position 123 is Ala,
Met, Glu, His, Ser, Pro, Tyr, or Leu"

<400> 2

Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn Cys
1 5 10 15

Xaa Xaa Xaa Ile Xaa Glu Xaa Xaa Xaa Leu Lys Xaa Xaa Xaa Xaa
20 25 30

Xaa Xaa Xaa Asp Xaa Xaa Asn Leu Asn Xaa Glu Xaa Xaa Xaa Ile Leu
35 40 45

Met Xaa Xaa Asn Leu Xaa Xaa Xaa Asn Leu Glu Xaa Phe Xaa Xaa Xaa
50 55 60

Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Ile Glu Xaa Xaa Leu Xaa Xaa
65 70 75 80

Leu Xaa Xaa Cys Xaa Pro Xaa Xaa Thr Ala Xaa Pro Xaa Arg Xaa Xaa
85 90 95

Xaa Xaa Xaa Xaa Xaa Gly Asp Xaa Xaa Xaa Phe Xaa Xaa Lys Leu Xaa
100 105 110

Phe Xaa Xaa Xaa Xaa Leu Glu Xaa Xaa Xaa Xaa Gln Gln Thr Thr Leu
115 120 125

Ser Leu Ala Ile Phe
130

<210> 3

<211> 133

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<223> /note= "Met- may or may not precede
the amino acid in position 1"

<220>

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<222> 17

<223> /note= "Xaa at position 17 is Ser,
Gly, Asp, or Gln"

<220>

<221> MUTAGEN

<222> 18

<223> /note= "Xaa at position 18 is Asn,
His, or Ile"

<220>

<221> MUTAGEN

<222> 23
<223> /note= "Xaa at position 23 is Ile,
Ala, Leu, or Gly"

<220>
<221> MUTAGEN
<222> 25
<223> /note= "Xaa at position 25 is Thr,
His, or Gln"

<220>
<221> MUTAGEN
<222> 26
<223> /note= "Xaa at position 26 is His
or Ala"

<220>
<221> MUTAGEN
<222> 29
<223> /note= "Xaa at position 29 is Gln
or Asn"

<220>
<221> MUTAGEN
<222> 30
<223> /note= "Xaa at position 30 is Pro
or Gly"

<220>
<221> MUTAGEN
<222> 32
<223> /note= "Xaa at position 32 is Leu,
Arg, Asn, or Ala"

<220>
<221> MUTAGEN
<222> 34
<223> /note= "Xaa at position 34 is Leu,
Val, Ser, Ala, Arg, Gln, Glu, Ile, Phe, Thr, or Met"

<220>
<221> MUTAGEN
<222> 35
<223> /note= "Xaa at position 35 is Leu,
Ala, Asn, or Pro"

<220>
<221> MUTAGEN
<222> 38
<223> /note= "Xaa at position 38 is Asn
or Ala"

<220>
<221> MUTAGEN
<222> 42
<223> /note= "Xaa at position 42 is Gly,
Asp, Ser, Ala, Asn, Ile, Leu, Met, Tyr, or Arg"

<220>
<221> MUTAGEN
<222> 45
<223> /note= "Xaa at position 45 is Gln,
Val, Met, Leu, Ala, Asn, Glu, or Lys"

<220>
<221> MUTAGEN
<222> 46
<223> /note= "Xaa at position 46 is Asp,
Phe, Ser, Gln, Glu, His, Val, or Thr"

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<222> 50
<223> /note= "Xaa at position 50 is Glu,
Asn, Ser, or Asp"

<220>
<221> MUTAGEN
<222> 51
<223> /note= "Xaa at position 51 is Asn,
Arg, Pro, Thr, or His"

<220>
<221> MUTAGEN
<222> 55
<223> /note= "Xaa at position 55 is Arg,
Leu, or Gly"

<220>
<221> MUTAGEN
<222> 56
<223> /note= "Xaa at position 56 is Pro,
Gly, Ser, Ala, Asn, Val, Leu, or Gln"

<220>
<221> MUTAGEN
<222> 62
<223> /note= "Xaa at position 62 is Asn,
Pro, or Thr"

<220>
<221> MUTAGEN
<222> 64
<223> /note= "Xaa at position 64 is Ala
or Asn"

<220>
<221> MUTAGEN
<222> 65
<223> /note= "Xaa at position 65 is Val
or Thr"

<220>
<221> MUTAGEN
<222> 67
<223> /note= "Xaa at position 67 is Ser
or Phe"

<220>
<221> MUTAGEN
<222> 68
<223> /note= "Xaa at position 68 is Leu
or Phe"

<220>
<221> MUTAGEN
<222> 69
<223> /note= "Xaa at position 69 is Gln,
Ala, Glu, or Arg"

<220>
<221> MUTAGEN
<222> 76
<223> /note= "Xaa at position 76 is Ser,
Val, Asn, Pro, or Gly"

<220>
<221> MUTAGEN
<222> 77
<223> /note= "Xaa at position 77 is Ile
or Leu"

<220>
<221> MUTAGEN
<222> 79
<223> /note= "Xaa at position 79 is Lys,
Asn, Met, Arg, Ile, or Gly"

<220>
<221> MUTAGEN
<222> 80
<223> /note= "Xaa at position 80 is Asn,

Gly, Glu, or Arg"

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<220>
<221> MUTAGEN
<222> 82
<223> /note= "Xaa at position 82 is Leu,
      Gln, Trp, Arg, Asp, Asn, Glu, His, Met, Phe, Ser,
      Thr, Tyr, or Val"

<220>
<221> MUTAGEN
<222> 87
<223> /note= "Xaa at position 87 is Leu
      or Ser"

<220>
<221> MUTAGEN
<222> 88
<223> /note= "Xaa at position 88 is Ala
      or Trp"

<220>
<221> MUTAGEN
<222> 91
<223> /note= "Xaa at position 91 is Ala
      or Pro"

<220>
<221> MUTAGEN
<222> 93
<223> /note= "Xaa at position 93 is Thr,
      Asp, or Ala"

<220>
<221> MUTAGEN
<222> 95
<223> /note= "Xaa at position 95 is His,
      Pro, Arg, Val, Gly, Asn, Ser, or Thr"

<220>
<221> MUTAGEN
<222> 98
<223> /note= "Xaa at position 98 is His,
      Ile, Asn, Ala, Thr, Gln, Glu, Lys, Met, Ser, Tyr,
      Val, or Leu"

<220>
<221> MUTAGEN
<222> 99
<223> /note= "Xaa at position 99 is Ile
      or Leu"

<220>
<221> MUTAGEN
<222> 100
<223> /note= "Xaa at position 100 is Lys
      or Arg"

<220>
<221> MUTAGEN
<222> 101
<223> /note= "Xaa at position 101 is Asp,
      Pro, Met, Lys, Thr, His, Asn, Ile, Leu, or Tyr"

<220>
<221> MUTAGEN
<222> 105
<223> /note= "Xaa at position 105 is Asn,
      Pro, Ser, Ile, or Asp"

<220>
<221> MUTAGEN
<222> 108
<223> /note= "Xaa at position 108 is Arg, Ala,
      or Ser"
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<221> MUTAGEN
<222> 109
<223> /note= "Xaa at position 109 is Arg,
        Thr, Glu, Leu, or Ser"

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<221> MUTAGEN
<222> 112
<223> /note= "Xaa at position 112 is Thr
        or Gln"

<220>
<221> MUTAGEN
<222> 116
<223> /note= "Xaa at position 116 is Lys,
        Val, Trp, Ala, His, Phe, Tyr, or Ile"

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<221> MUTAGEN
<222> 117
<223> /note= "Xaa at position 117 is Thr
        or Ser"

<220>
<221> MUTAGEN
<222> 120
<223> /note= "Xaa at position 120 is Asn,
        Pro, Leu, His, Val, or Gln"

<220>
<221> MUTAGEN
<222> 121
<223> /note= "Xaa at position 121 is Ala,
        Ser, Ile, Pro, or Asp"

<220>
<221> MUTAGEN
<222> 122
<223> /note= "Xaa at position 122 is Gln,
        Met, Trp, Phe, Pro, His, Ile, or Tyr"

<220>
<221> MUTAGEN
<222> 123
<223> /note= "Xaa at position 123 is Ala,
        Met, Glu, Ser, or Leu"

<400> 3

Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn Cys
1      5      10      15

Xaa Xaa Met Ile Asp Glu Xaa Ile Xaa Xaa Leu Lys Xaa Xaa Pro Xaa
20      25      30

Pro Xaa Xaa Asp Phe Xaa Asn Leu Asn Xaa Glu Asp Xaa Xaa Ile Leu
35      40      45

Met Xaa Xaa Asn Leu Arg Xaa Xaa Asn Leu Glu Ala Phe Xaa Arg Xaa
50      55      60

Xaa Lys Xaa Xaa Xaa Asn Ala Ser Ala Ile Glu Xaa Xaa Leu Xaa Xaa
65      70      75      80

Leu Xaa Pro Cys Leu Pro Xaa Xaa Thr Ala Xaa Pro Xaa Arg Xaa Pro
85      90      95

Ile Xaa Xaa Xaa Xaa Gly Asp Trp Xaa Glu Phe Xaa Xaa Lys Leu Xaa
100     105     110

Phe Tyr Leu Xaa Xaa Leu Glu Xaa Xaa Xaa Xaa Gln Gln Thr Thr Leu
115     120     125

Ser Leu Ala Ile Phe
130

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<210> 4
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<212> PRT
<213> Artificial Sequence

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<222> 1
<223> /note= "Met- or Met-Ala- may or may
not precede the amino acid in position 1"

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<221> MUTAGEN
<222> 3
<223> /note= "Xaa at position 3 is Ser,
Lys, Gly, Asp, Met, Gln, or Arg"

<220>
<221> MUTAGEN
<222> 4
<223> /note= "Xaa at position 4 is Asn,
His, Leu, Ile, Phe, Arg, or Gln"

<220>
<221> MUTAGEN
<222> 5
<223> /note= "Xaa at position 5 is Met,
Phe, Ile, Arg, Gly, Ala, or Cys"

<220>
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<222> 6
<223> /note= "Xaa at position 6 is Ile,
Cys, Gln, Glu, Arg, Pro, or Ala"

<220>
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<222> 7
<223> /note= "Xaa at position 7 is Asp,
Phe, Lys, Arg, Ala, Gly, Glu, Gln, Asn, Thr, Ser,
or Val"

<220>
<221> MUTAGEN
<222> 8
<223> /note= "Xaa at position 8 is Glu,
Trp, Pro, Ser, Ala, His, Asp, Asn, Gln, Leu, Val,
or Gly"

<220>
<221> MUTAGEN
<222> 9
<223> /note= "Xaa at position 9 is
Ile, Val, Ala, Leu, Gly, Trp, Lys, Phe, Leu, Ser
or Arg"

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<222> 10
<223> /note= "Xaa at position 10 is Ile,
Gly, Val, Arg, Ser, Phe, or Leu"

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<223> /note= "Xaa at position 11 is Thr,
His, Gly, Gln, Arg, Pro, or Ala"

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<222> 12
<223> /note= "Xaa at position 12 is His,
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<220>

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<223> /note= "Xaa at position 13 is Leu,
Gly, Arg, Thr, Ser, or Ala"

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<223> /note= "Xaa at position 14 is Lys,
Arg, Leu, Gln, Gly, Pro, Val, or Trp"

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<223> /note= "Xaa at position 15 is Gln,
Asn, Leu, Pro, Arg, or Val"

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<222> 16
<223> /note= "Xaa at position 16 is Pro,
His, Thr, Gly, Asp, Gln, Ser, Leu, or Lys"

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<222> 17
<223> /note= "Xaa at position 17 is Pro,
Asp, Gly, Ala, Arg, Leu, or Gln"

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<223> /note= "Xaa at position 18 is Leu,
Val, Arg, Gln, Asn, Gly, Ala, or Glu"

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<223> /note= "Xaa at position 19 is Pro,
Leu, Gln, Ala, Thr, or Glu"

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<223> /note= "Xaa at position 20 is Leu,
Val, Gly, Ser, Lys, Glu, Gln, Thr, Arg, Ala, Phe,
Ile, or Met"

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<223> /note= "Xaa at position 21 is Leu,
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<222> 22
<223> /note= "Xaa at position 22 is Asp,
Leu, or Val"

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<223> /note= "Xaa at position 23 is Phe,
Ser, Pro, Trp, or Ile"

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<223> /note= "Xaa at position 24 is Asn
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<223> /note= "Xaa at position 26 is Leu,

Trp, or Arg"

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<222> 27
<223> /note= "Xaa at position 27 is Asn,
Cys, Arg, Leu, His, Met, or Pro"

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<222> 28
<223> /note= "Xaa at position 28 is Gly,
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Phe, Tyr, Ile, or Met"

<220>
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<223> /note= "Xaa at position 29 is Glu,
Asn, Tyr, Leu, Phe, Asp, Ala, Cys, Gln, Arg, Thr,
Gly, or Ser"

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<223> /note= "Xaa at position 30 is Asp,
Ser, Leu, Arg, Lys, Thr, Met, Trp, Glu, Asn, Gln,
Ala, or Pro"

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<222> 31
<223> /note= "Xaa at position 31 is Gln,
Pro, Phe, Val, Met, Leu, Thr, Lys, Asp, Asn, Arg,
Ser, Ala, Ile, Glu, His, or Trp"

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<223> /note= "Xaa at position 32 is Asp,
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Tyr, Ile, Val, or Gly"

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<223> /note= "Xaa at position 33 is Ile,
Gly, Val, Ser, Arg, Pro, or His"

<220>
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<222> 34
<223> /note= "Xaa at position 34 is Leu,
Ser, Cys, Arg, Ile, His, Phe, Glu, Lys, Thr, Ala,
Met, Val, or Asn"

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<223> /note= "Xaa at position 35 is Met,
Arg, Ala, Gly, Pro, Asn, His, or Asp"

<220>
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<223> /note= "Xaa at position 36 is Glu,
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His, Phe, Met, or Gln"

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<223> /note= "Xaa at position 37 is Asn,
Arg, Met, Pro, Ser, Thr, or His"

<220>

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<223> /note= "Xaa at position 38 is Asn,
His, Arg, Leu, Gly, Ser, or Thr"

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<223> /note= "Xaa at position 39 is
Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser, or Met"

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<223> /note= "Xaa at position 40 is Arg,
Asp, Ile, Ser, Val, Thr, Gln, Asn, Lys, His,
Ala, or Leu"

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<223> /note= "Xaa at position 41 is Arg,
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<223> /note= "Xaa at position 42 is Pro,
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Phe, Leu, Val, or Lys"

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<223> /note= "Xaa at position 43 is Asn
or Gly"

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<223> /note= "Xaa at position 44 is Leu,
Ser, Asp, Arg, Gln, Val, or Cys"

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<223> /note= "Xaa at position 45 is Glu,
Tyr, His, Leu, Pro, or Arg"

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<223> /note= "Xaa at position 46 is Ala,
Ser, Pro, Tyr, Asn, or Thr"

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<223> /note= "Xaa at position 47 is Phe,
Asn, Glu, Pro, Lys, Arg, or Ser"

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<223> /note= "Xaa at position 48 is Asn,
His, Val, Arg, Pro, Thr, Asp, or Ile"

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<223> /note= "Xaa at position 49 is Arg,
Tyr, Trp, Lys, Ser, His, Pro, or Val"

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<223> /note= "Xaa at position 50 is Ala,
Asn, Pro, Ser, or Lys"

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<223> /note= "Xaa at position 51 is Val,
Thr, Pro, His, Leu, Phe, or Ser"

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<223> /note= "Xaa at position 52 is Lys,
Ile, Arg, Val, Asn, Glu, or Ser"

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<223> /note= "Xaa at position 53 is Ser,
Ala, Phe, Val, Gly, Asn, Ile, Pro, or His"

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<223> /note= "Xaa at position 54 is Leu,
Val, Trp, Ser, Ile, Phe, Thr, or His"

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<223> /note= "Xaa at position 55 is Gln,
Ala, Pro, Thr, Glu, Arg, Trp, Gly, or Leu"

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<222> 56
<223> /note= "Xaa at position 56 is Asn,
Leu, Val, Trp, Pro, or Ala"

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<223> /note= "Xaa at position 57 is Ala,
Met, Leu, Pro, Arg, Glu, Thr, Gln, Trp, or Asn"

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<222> 58
<223> /note= "Xaa at position 58 is Ser,
Glu, Met, Ala, His, Asn, Arg, or Asp"

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<222> 59
<223> /note= "Xaa at position 59 is Ala,
Glu, Asp, Leu, Ser, Gly, Thr, or Arg"

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<223> /note= "Xaa at position 60 is Ile,
Met, Thr, Pro, Arg, Gly, Ala"

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<223> /note= "Xaa at position 61 is
Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser, Gln,
or Leu"

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<222> 62
<223> /note= "Xaa at position 62 is Ser,
Val, Ala, Asn, Trp, Glu, Pro, Gly, or Asp"

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<223> /note= "Xaa at position 63 is Ile,
Ser, Arg, Thr, or Leu"

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<223> /note= "Xaa at position 64 is Leu,
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<223> /note= "Xaa at position 65 is Lys,
Thr, Gly, Asn, Met, Arg, Ile, or Asp"

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<223> /note= "Xaa at position 66 is Asn,
Trp, Val, Gly, Thr, Leu, Glu, or Arg"

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<223> /note= "Xaa at position 67 is Leu,
Gln, Gly, Ala, Trp, Arg, Val, or Lys"

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Tyr, Phe, Ile, Met, or Val"

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Ala, Thr, Trp, Arg, or Met"

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Glu, Gly, Arg, Met, or Val"

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<223> /note= "Xaa at position 71 is Leu,
Asn, Val, or Gln"

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<223> /note= "Xaa at position 72 is Pro,
Cys, Arg, Ala, or Lys"

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<223> /note= "Xaa at position 73 is Leu,
Ser, Trp, or Gly"

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<223> /note= "Xaa at position 74 is Ala,
Lys, Arg, Val, or Trp"

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<223> /note= "Xaa at position 75 is Thr,
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<223> /note= "Xaa at position 76 is Ala,
Pro, Ser, Thr, Gly, Asp, Ile, or Met"

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<223> /note= "Xaa at position 77 is Ala,
Pro, Ser, Thr, Phe, Leu, Asp, or His"

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<223> /note= "Xaa at position 78 is Pro,
Phe, Arg, Ser, Lys, His, Ala, Gly, Ile, or Leu"

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<223> /note= "Xaa at position 79 is Thr,
Asp, Ser, Asn, Pro, Ala, Leu, or Arg"

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<223> /note= "Xaa at position 80 is Arg,
Ile, Ser, Glu, Leu, Val, Gln, Lys, His, Ala, or Pro"

<220>
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<222> 81
<223> /note= "Xaa at position 81 is His,
Gln, Pro, Arg, Val, Leu, Gly, Thr, Asn, Lys, Ser,
Ala, Trp, Phe, Ile, or Tyr"

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<222> 82
<223> /note= "Xaa at position 82 is Pro,
Lys, Tyr, Gly, Ile, or Thr"

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<222> 83
<223> /note= "Xaa at position 83 is Ile,
Val, Lys, Ala, or Asn"

<220>
<221> MUTAGEN
<222> 84
<223> /note= "Xaa at position 84 is His,
Ile, Asn, Leu, Asp, Ala, Thr, Glu, Gln, Ser,
Phe, Met, Val, Lys, Arg, Tyr, or Pro"

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<223> /note= "Xaa at position 85 is
Ile, Leu, Arg, Asp, Val, Pro, Gln, Gly, Ser,
Phe, or His"

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<222> 86
<223> /note= "Xaa at position 86 is
Lys, Tyr, Leu, His, Arg, Ile, Ser, Gln, or Pro"

<220>
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<222> 87
<223> /note= "Xaa at position 87 is

Asp, Pro, Met, Lys, His, Thr, Val, Tyr, Glu, Asn,
Ser, Ala, Gly, Ile, Leu, or Gln"

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<223> /note= "Xaa at position 88 Gly,
Leu, Glu, Lys, Ser, Tyr, or Pro"

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<223> /note= "Xaa at position 89 is Asp
or Ser"

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<223> /note= "Xaa at position 90 is
Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu, Gln, Lys,
Ala, Phe, or Gly"

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<223> /note= "Xaa at position 91 is
Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr, Leu, Lys,
Ile, Asp, or His"

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<223> /note= "Xaa at position 92 is Glu,
Ser, Ala, Lys, Thr, Ile, Gly, or Pro"

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<223> /note= "Xaa at position 94 is Arg,
Lys, Asp, Leu, Thr, Ile, Gln, His, Ser, Ala, or Pro"

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<223> /note= "Xaa at position 95 is Arg,
Thr, Pro, Glu, Tyr, Leu, Ser, or Gly"

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<223> /note= "Xaa at position 96 is Lys,
Asn, Thr, Leu, Gln, Arg, His, Glu, Ser, Ala,
or Trp"

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<223> /note= "Xaa at position 97 is Leu,
Ile, Arg, Asp, or Met"

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<223> /note= "Xaa at position 98 is Thr,
Val, Gln, Tyr, Glu, His, Ser, or Phe"

<220>
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<223> /note= "Xaa at position 99 is Phe,
Ser, Cys, His, Gly, Trp, Tyr, Asp, Lys, Leu, Ile,
Val, or Asn"

<220>
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<222> 100

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<223>    /note= "Xaa at position 100 is Tyr,
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<223>    /note= "Xaa at position 101 is Leu,
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<220>
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<222>    102
<223>    /note= "Xaa at position 102 is
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           Ser, Asn, His, Ala, Tyr, Phe, Gln, or Ile"

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<223>    /note= "Xaa at position 103 is Thr,
           Ser, Asn, Ile, Trp, Lys, or Pro"

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<222>    104
<223>    /note= "Xaa at position 104 is Leu,
           Ser, Pro, Ala, Glu, Cys, Asp, or Tyr"

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<222>    105
<223>    /note= "Xaa at position 105 is Glu,
           Ser, Lys, Pro, Leu, Thr, Tyr, or Arg"

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<222>    106
<223>    /note= "Xaa at position 106 is Asn,
           Ala, Pro, Leu, His, Val or Gln"

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<222>    107
<223>    /note= "Xaa at position 107 is Ala,
           Ser, Ile, Asn, Pro, Lys, Asp, or Gly"

<220>
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<222>    108
<223>    /note= "Xaa at position 108 is
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           or Cys"

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<223>    /note= "Xaa at position 109 is Ala,
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Asn Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1          5          10          15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Xaa Xaa Xaa
20          25          30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
35          40          45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
50          55          60

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
65          70          75          80

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<223> /note= "Xaa at position 17 is Pro,
Asp, Gly, or Gln"

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<223> /note= "Xaa at position 18 is Leu,
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<223> /note= "Xaa at position 19 is Pro
or Glu"

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Val, Gly, Ser, Lys, Ala, Arg, Gln, Glu, Ile, Phe,
Thr, or Met"

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<223> /note= "Xaa at position 21 is Leu,
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<223> /note= "Xaa at position 23 is Phe,
Ser, Pro, or Trp"

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<223> /note= "Xaa at position 24 is Asn
or Ala"

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<223> /note= "Xaa at position 28 is Gly,
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<223> /note= "Xaa at position 30 is Asp
or Glu"

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<223> /note= "Xaa at position 31 is Gln,
Val, Met, Leu, Thr, Ala, Asn, Glu, Ser, or Lys"

<220>
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<223> /note= "Xaa at position 32 is Asp,
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Tyr, Val, or Cys"

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<223> /note= "Xaa at position 36 is Glu,
Ala, Asn, Ser, or Asp"

<220>
<221> MUTAGEN

<222> 37
<223> /note= "Xaa at position 37 is Asn,
Arg, Met, Pro, Ser, Thr, or His"

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<223> /note= "Xaa at position 40 is Arg
or Ala"

<220>
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<222> 41
<223> /note= "Xaa at position 41 is Arg,
Thr, Val, Leu, or Gly"

<220>
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<223> /note= "Xaa at position 42 is Pro,
Gly, Ser, Gln, Ala, Arg, Asn, Glu, Leu, Thr, Val,
or Lys"

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<223> /note= "Xaa at position 46 is Ala
or Ser"

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<223> /note= "Xaa at position 48 is Asn,
Pro, Thr, or Ile"

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<223> /note= "Xaa at position 49 is Arg
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<223> /note= "Xaa at position 52 is Lys
or Arg"

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Phe, or His"

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Ile, Phe, or His"

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Glu, Arg, or Asp"

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or Leu"

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Val, Ala, Asn, Glu, Pro, or Gly"

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<223> /note= "Xaa at position 63 is Ile
or Leu"

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<223> /note= "Xaa at position 65 is Lys,
Thr, Gly, Asn, Met, Arg, Ile, Gly, or Asp"

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<223> /note= "Xaa at position 66 is Asn,
Gly, Glu, or Arg"

<220>
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<223> /note= "Xaa at position 68 is Leu,
Gln, Trp, Arg, Asp, Ala, Asn, Glu, His, Ile, Met,
Phe, Ser, Thr, Tyr, or Val"

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or Thr"

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<223> /note= "Xaa at position 71 is Leu
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or Trp"

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<223> /note= "Xaa at position 77 is Ala
or Pro"

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<222> 79
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Asp, Ser, Pro, Ala, Leu, or Arg"

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<222> 81
<223> /note= "Xaa at position 81 is His,
Pro, Arg, Val, Leu, Gly, Asn, Phe, Ser, or Thr"

<220>
<221> MUTAGEN
<222> 82
<223> /note= "Xaa at position 82 is Pro
or Tyr"

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<221> MUTAGEN
<222> 83
<223> /note= "Xaa at position 83 is Ile
or Val"

<220>
<221> MUTAGEN
<222> 84
<223> /note= "Xaa at position 84 is His,
Ile, Asn, Leu, Ala, Thr, Arg, Gln, Lys,
Met, Ser, Tyr, Val, or Pro"

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<222> 85
<223> /note= "Xaa at position 85 is Ile,
Leu, or Val"

<220>
<221> MUTAGEN
<222> 86
<223> /note= "Xaa at position 86 is Lys,
Arg, Ile, Gln, Pro, or Ser"

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<221> MUTAGEN
<222> 87
<223> /note= "Xaa at position 87 is Asp,
Pro, Met, Lys, His, Thr, Asn, Ile, Leu, or Tyr"

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<222> 90
<223> /note= "Xaa at position 90 is Trp
or Leu"

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<221> MUTAGEN
<222> 91
<223> /note="Xaa at position 91 is Asn,
Pro, Ala, Ser, Trp, Gln, Tyr, Leu, Lys, Ile, Asp,
or His"

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<222> 92
<223> /note= "Xaa at position 92 is Glu
or Gly"

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<221> MUTAGEN
<222> 94
<223> /note= "Xaa at position 94 is Arg,

Ala, or Ser"

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<223> /note= "Xaa at position 95 is Arg,
        Thr, Glu, Leu, or Ser"

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<221> MUTAGEN
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<223> /note= "Xaa at position 98 is Thr,
        Val, or Gln"

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<223> /note= "Xaa at position 100 is Tyr
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<222> 101
<223> /note= "Xaa at position 101 is Leu
        or Ala"

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<222> 102
<223> /note= "Xaa at position 102 is Lys,
        Thr, Val, Trp, Ser, Ala, His, Met, Phe, Tyr, or Ile"

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<221> MUTAGEN
<222> 103
<223> /note= "Xaa at position 103 is Thr
        or Ser"

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<221> MUTAGEN
<222> 106
<223> /note= "Xaa at position 106 is Asn,
        Pro, Leu, His, Val, or Gln"

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<221> MUTAGEN
<222> 107
<223> /note= "Xaa at position 107 is Ala,
        Ser, Ile, Asn, Pro, Asp, or Gly"

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<222> 108
<223> /note= "Xaa at position 108 is Gln,
        Ser, Met, Trp, Arg, Phe, Pro, His, Ile, Tyr, or Cys"

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<221> MUTAGEN
<222> 109
<223> /note= "Xaa at position 109 is Ala,
        Met, Glu, His, Ser, Pro, Tyr, or Leu"

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Asn Cys Xaa Xaa Xaa Ile Xaa Glu Xaa Xaa Xaa Xaa Leu Lys Xaa Xaa
1          5          10          15

Xaa Xaa Xaa Xaa Xaa Asp Xaa Xaa Asn Leu Asn Xaa Glu Xaa Xaa Xaa
20          25          30

Ile Leu Met Xaa Xaa Asn Leu Xaa Xaa Xaa Asn Leu Glu Xaa Phe Xaa
35          40          45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Ile Glu Xaa Xaa Leu
50          55          60

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Xaa Xaa Leu Xaa Xaa Cys Xaa Pro Xaa Xaa Thr Ala Xaa Pro Xaa Arg
65 70 75 80

Xaa Xaa Xaa Xaa Xaa Xaa Gly Asp Xaa Xaa Xaa Phe Xaa Xaa Lys
85 90 95

Leu Xaa Phe Xaa Xaa Xaa Xaa Leu Glu Xaa Xaa Xaa Gln Gln
100 105 110

<210> 6

<211> 111

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<213> Artificial Sequence

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<223> /note= "Met- or Met-Ala- may or may
not precede the amino acid in position 1"

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<222> 3

<223> /note= "Xaa at position 3 is Ser,
Gly, Asp, or Gln"

<220>

<221> MUTAGEN

<222> 4

<223> /note= "Xaa at position 4 is Asn,
His, or Ile"

<220>

<221> MUTAGEN

<222> 9

<223> /note= "Xaa at position 9 is Ile,
Ala, Leu, or Gly"

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<221> MUTAGEN

<222> 11

<223> /note= "Xaa at position 11 is Thr,
His, or Gln"

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<221> MUTAGEN

<222> 12

<223> /note= "Xaa at position 12 is His
or Ala"

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<221> MUTAGEN

<222> 15

<223> /note= "Xaa at position 15 is Gln
or Asn"

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<221> MUTAGEN

<222> 16

<223> /note= "Xaa at position 16 is Pro
or Gly"

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<221> MUTAGEN

<222> 18

<223> /note= "Xaa at position 18 is Leu,
Arg, Asn, or Ala"

<220>

<221> MUTAGEN

<222> 20

<223> /note= "Xaa at position 20 is Leu,
Val, Ser, Ala, Arg, Gln, Glu, Ile, Phe, Thr, or Met"

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<221> MUTAGEN

<222> 21
<223> /note= "Xaa at position 21 is Leu,
Ala, Asn, or Pro"

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<222> 24
<223> /note= "Xaa at position 24 is Asn
or Ala"

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<222> 28
<223> /note= "Xaa at position 28 is Gly,
Asp, Ser, Ala, Asn, Ile, Leu, Met, Tyr, or Arg"

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<222> 31
<223> /note= "Xaa at position 31 is Gln,
Val, Met, Leu, Ala, Asn, Glu, or Lys"

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<222> 32
<223> /note= "Xaa at position 32 is Asp,
Phe, Ser, Ala, Gln, Glu, His, Val, or Thr"

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<222> 36
<223> /note= "Xaa at position 36 is Glu,
Asn, Ser, or Asp"

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<222> 37
<223> /note= "Xaa at position 37 is Asn,
Arg, Pro, Thr, or His"

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<222> 41
<223> /note= "Xaa at position 41 is Arg,
Leu, or Gly"

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<222> 42
<223> /note= "Xaa at position 42 is Pro,
Gly, Ser, Ala, Asn, Val, Leu, or Gln"

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<222> 48
<223> /note= "Xaa at position 48 is Asn,
Pro, or Thr"

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<222> 50
<223> /note= "Xaa at position 50 is Ala
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<222> 51
<223> /note= "Xaa at position 51 is Val
or Thr"

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<223> /note= "Xaa at position 53 is Ser
or Phe"

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<223> /note= "Xaa at position 54 is Leu
or Phe"

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<222> 55
<223> /note= "Xaa at position 55 is Gln,
Ala, Glu, or Arg"

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<222> 62
<223> /note= "Xaa at position 62 is Ser,
Val, Asn, Pro, or Gly"

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<222> 63
<223> /note= "Xaa at position 63 is Ile
or Leu"

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<221> MUTAGEN
<222> 65
<223> /note= "Xaa at position 65 is Lys,
Asn, Met, Arg, Ile, or Gly"

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<223> /note= "Xaa at position 66 is Asn,
Gly, Glu, or Arg"

<220>
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<222> 68
<223> /note= "Xaa at position 68 is Leu,
Gln, Trp, Arg, Asp, Asn, Glu, His, Met, Phe, Ser,
Thr, Tyr, or Val"

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<223> /note= "Xaa at position 73 is Leu
or Ser"

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<221> MUTAGEN
<222> 74
<223> /note= "Xaa at position 74 is Ala
or Trp"

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<221> MUTAGEN
<222> 77
<223> /note= "Xaa at position 77 is Ala
or Pro"

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<221> MUTAGEN
<222> 79
<223> /note= "Xaa at position 79 is Thr,
Asp, or Ala"

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<221> MUTAGEN
<222> 81
<223> /note= "Xaa at position 81 is His,
Pro, Arg, Val, Gly, Asn, Ser, or Thr"

<220>
<221> MUTAGEN
<222> 84

<223> /note= "Xaa at position 84 is His,
Ile, Asn, Leu, Ala, Thr, Arg, Gln, Glu, Lys, Met,
Ser, Tyr, Val, or Leu"

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<222> 85
<223> /note= "Xaa at position 85 is Ile
or Leu"

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<221> MUTAGEN
<222> 86
<223> /note= "Xaa at position 86 is Lys
or Arg"

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<221> MUTAGEN
<222> 87
<223> /note= "Xaa at position 87 is Asp,
Pro, Met, Lys, His, Pro, Asn, Ile, Leu, or Tyr"

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<222> 91
<223> /note= "Xaa at position 91 is Asn,
Pro, Ser, Ile, or Asp"

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<222> 94
<223> /note= "Xaa at position 94 is Arg,
Ala, or Ser"

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<222> 95
<223> /note= "Xaa at position 95 is Arg,
Thr, Glu, Leu, or Ser"

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<223> /note= "Xaa at position 98 is Thr
or Gln"

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<222> 102
<223> /note= "Xaa at position 102 is Lys,
Val, Trp, or Ile"

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<222> 103
<223> /note= "Xaa at position 103 is Thr,
Ala, His, Phe, Tyr, or Ser"

<220>
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<222> 106
<223> /note= "Xaa at position 106 is Asn,
Pro, Leu, His, Val, or Gln"

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<221> MUTAGEN
<222> 107
<223> /note= "Xaa at position 107 is Ala,
Ser, Ile, Pro, or Asp"

<220>
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<223> /note= "Xaa at position 108 is Gln,
Met, Trp, Phe, Pro, His, Ile, or Tyr"

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<222> 109
<223> /note= "Xaa at position 109 is Ala,
Met, Glu, Ser, or Leu"

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Asn Cys Xaa Xaa Met Ile Asp Glu Xaa Ile Xaa Xaa Leu Lys Xaa Xaa
1 5 10 15
Pro Xaa Pro Xaa Xaa Asp Phe Xaa Asn Leu Asn Xaa Glu Asp Xaa Xaa
20 25 30
Ile Leu Met Xaa Xaa Asn Leu Arg Xaa Xaa Asn Leu Glu Ala Phe Xaa
35 40 45
Arg Xaa Xaa Lys Xaa Xaa Xaa Asn Ala Ser Ala Ile Glu Xaa Xaa Leu
50 55 60
Xaa Xaa Leu Xaa Pro Cys Leu Pro Xaa Xaa Thr Ala Xaa Pro Xaa Arg
65 70 75 80
Xaa Pro Ile Xaa Xaa Xaa Xaa Gly Asp Trp Xaa Glu Phe Xaa Xaa Lys
85 90 95
Leu Xaa Phe Tyr Leu Xaa Xaa Leu Glu Xaa Xaa Xaa Xaa Gln Gln
100 105 110

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the amino acid in position 1"

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<222> 18
<223> /note= "Xaa at position 18 is Asn
or Ile"

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<223> /note= "Xaa at position 19 is Met,
Ala, or Ile"

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<222> 20
<223> /note= "Xaa at position 20 is Ile,
Pro, or Leu"

<220>
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<222> 23
<223> /note= "Xaa at position 23 is Ile,
Ala, or Leu"

<220>
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<223> /note= "Xaa at position 25 is Thr
or His"

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<222> 29
<223> /note= "Xaa at position 29 is Gln,
Arg, Val, or Ile"

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<223> /note= "Xaa at position 32 is Leu,
Ala, Asn, or Arg"

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<223> /note= "Xaa at position 34 is Leu
or Ser"

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<223> /note= "Xaa at position 37 is Phe,
Pro, or Ser"

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<223> /note= "Xaa at position 38 is Asn
or Ala"

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<223> /note= "Xaa at position 42 is Gly,
Ala, Ser, Asp, or Asn"

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<223> /note= "Xaa at position 45 is Gln,
Val, or Met"

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<223> /note= "Xaa at position 46 is Asp
or Ser"

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<223> /note= "Xaa at position 49 is Met,
Ile, Leu, or Asp"

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<223> /note= "Xaa at position 50 is Glu
or Asp"

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<223> /note= "Xaa at position 51 is Asn,
Arg, or Ser"

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<223> /note= "Xaa at position 55 is Arg,
Leu, or Thr"

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or Ser"

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or Leu"

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or Ser"

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Val, or Pro"

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or His"

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<223> /note= "Xaa at position 65 is Val
or Ser"

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<222> 67
<223> /note= "Xaa at position 67 is Ser,
Asn, His, or Gln"

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<223> /note= "Xaa at position 69 is Gln
or Glu"

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<223> /note= "Xaa at position 73 is Ala
or Gly"

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<222> 76
<223> /note= "Xaa at position 76 is Ser,
Ala, or Pro"

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<222> 79
<223> /note= "Xaa at position 79 is Lys,
Arg, or Ser"

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<222> 82
<223> /note= "Xaa at position 82 is Leu,
Glu, Val, or Trp"

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<222> 85
<223> /note= "Xaa at position 85 is Leu
or Val"

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<222> 87
<223> /note= "Xaa at position 87 is Leu,
Ser, or Tyr"

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<222> 88
<223> /note= "Xaa at position 88 is Ala
or Trp"

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or Pro"

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<223> /note= "Xaa at position 93 is Pro
or Ser"

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<223> /note= "Xaa at position 95 is His
or Thr"

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<223> /note= "Xaa at position 98 is His,
Ile, or Thr"

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or Arg"

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<222> 101
<223> /note= "Xaa at position 101 is Asp,
Ala, or Met"

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<223> /note= "Xaa at position 105 is Asn
or Glu"

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<223> /note= "Xaa at position 109 is Arg,
Glu, or Leu"

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<222> 112
<223> /note= "Xaa at position 112 is Thr
or Gln"

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<222> 116
<223> /note= "Xaa at position 116 is Lys,
Val, Trp, or Ser"

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<223> /note= "Xaa at position 117 is Thr
or Ser"

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<223> /note= "Xaa at position 120 is Asn,
Gln, or His"

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 <223> /note= "Xaa at position 123 is Ala
 or Glu"

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 Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn Cys
 1 5 10 15

 Ser Xaa Xaa Xaa Asp Glu Xaa Ile Xaa His Leu Lys Xaa Pro Pro Xaa
 20 25 30

 Pro Xaa Leu Asp Xaa Xaa Asn Leu Asn Xaa Glu Asp Xaa Xaa Ile Leu
 35 40 45

 Xaa Xaa Xaa Asn Leu Arg Xaa Xaa Asn Leu Xaa Xaa Phe Xaa Xaa Ala
 50 55 60

 Xaa Lys Xaa Leu Xaa Asn Ala Ser Xaa Ile Glu Xaa Ile Leu Xaa Asn
 65 70 75 80

 Leu Xaa Pro Cys Xaa Pro Xaa Xaa Thr Ala Xaa Pro Xaa Arg Xaa Pro
 85 90 95

 Ile Xaa Ile Xaa Xaa Gly Asp Trp Xaa Glu Phe Arg Xaa Lys Leu Xaa
 100 105 110

 Phe Tyr Leu Xaa Xaa Leu Glu Xaa Ala Gln Xaa Gln Gln Thr Thr Leu
 115 120 125

 Ser Leu Ala Ile Phe
 130

 <210> 8
 <211> 111
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 <223> /note= "Met- or Met-Ala may or may
 not precede the amino acid in position 1"

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 <223> /note= "Xaa at position 4 is Asn or
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 <220>
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 <222> 5
 <223> /note= "Xaa at position 5 is Met,
 Ala, or Ile"

 <220>
 <221> MUTAGEN
 <222> 6
 <223> /note= "Xaa at position 6 is Ile,
 Pro, or Leu"

 <220>
 <221> MUTAGEN
 <222> 9
 <223> /note= "Xaa at position 9 is Ile,
 Ala, or Leu"

 <220>
 <221> MUTAGEN
 <222> 11
 <223> /note= "Xaa at position 11 is Thr
 or His"

<220>
<221> MUTAGEN
<222> 15
<223> /note= "Xaa at position 15 is Gln,
Arg, Val, or Ile"

<220>
<221> MUTAGEN
<222> 18
<223> /note= "Xaa at position 18 is Leu,
Ala, Asn, or Arg"

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<221> MUTAGEN
<222> 20
<223> /note= "Xaa at position 20 is Leu
or Ser"

<220>
<221> MUTAGEN
<222> 23
<223> /note= "Xaa at position 23 is Phe,
Pro, or Ser"

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<221> MUTAGEN
<222> 24
<223> /note= "Xaa at position 24 is Asn
or Ala"

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<221> MUTAGEN
<222> 28
<223> /note= "Xaa at position 28 is Gly,
Ala, Ser, Asp, or Asn"

<220>
<221> MUTAGEN
<222> 31
<223> /note= "Xaa at position 31 is Gln,
Val, or Met"

<220>
<221> MUTAGEN
<222> 32
<223> /note= "Xaa at position 32 is Asp
or Ser"

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<221> MUTAGEN
<222> 35
<223> /note= "Xaa at position 35 is Met,
Ile, or Asp"

<220>
<221> MUTAGEN
<222> 36
<223> /note= "Xaa at position 36 is Glu
or Asp"

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<223> /note= "Xaa at position 37 is Asn,
Arg, or Ser"

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<221> MUTAGEN
<222> 41
<223> /note= "Xaa at position 41 is Arg,
Leu, or Thr"

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<222> 42
<223> /note= "Xaa at position 42 is Pro

or Ser"

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<223> /note= "Xaa at position 45 is Glu
or Leu"

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<223> /note= "Xaa at position 46 is Ala
or Ser"

<220>
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<222> 48
<223> /note= "Xaa at position 48 is Asn,
Val, or Pro"

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<222> 49
<223> /note= "Xaa at position 49 is Arg
or His"

<220>
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<223> /note= "Xaa at position 51 is Val
or Ser"

<220>
<221> MUTAGEN
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<223> /note= "Xaa at position 53 is Ser,
Asn, His, or Gln"

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<221> MUTAGEN
<222> 55
<223> /note= "Xaa at position 55 is Gln
or Glu"

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<223> /note= "Xaa at position 59 is Ala
or Gly"

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<222> 62
<223> /note= "Xaa at position 62 is Ser,
Ala, or Pro"

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<222> 65
<223> /note= "Xaa at position 65 is Lys,
Arg, or Ser"

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<222> 67
<223> /note= "Xaa at position 67 is Leu,
Glu, or Val"

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<221> MUTAGEN
<222> 68
<223> /note= "Xaa at position 68 is Leu,
Glu, Val, or Trp"

<220>
<221> MUTAGEN

<222> 71
<223> /note= "Xaa at position 71 is Leu
or Val"

<220>
<221> MUTAGEN
<222> 73
<223> /note= "Xaa at position 73 is Leu,
Ser, or Tyr"

<220>
<221> MUTAGEN
<222> 74
<223> /note= "Xaa at position 74 is Ala
or Trp"

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<223> /note= "Xaa at position 77 is Ala
or Pro"

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<222> 79
<223> /note= "Xaa at position 79 is Pro
or Ser"

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<223> /note= "Xaa at position 81 is His
or Thr"

<220>
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<222> 84
<223> /note= "Xaa at position 84 is His,
Ile, or Thr"

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<221> MUTAGEN
<222> 86
<223> /note= "Xaa at position 86 is Lys
or Arg"

<220>
<221> MUTAGEN
<222> 87
<223> /note= "Xaa at position 87 is Asp,
Ala, or Met"

<220>
<221> MUTAGEN
<222> 91
<223> /note= "Xaa at position 91 is Asn
or Glu"

<220>
<221> MUTAGEN
<222> 95
<223> /note= "Xaa at position 95 is Arg,
Glu, or Leu"

<220>
<221> MUTAGEN
<222> 98
<223> /note= "Xaa at position 98 is Thr
or Gln"

<220>
<221> MUTAGEN
<222> 102
<223> /note= "Xaa at position 102 is Lys,
Val, Trp, or Ser"

<220>
 <221> MUTAGEN
 <222> 103
 <223> /note= "Xaa at position 103 is Thr
 or Ser"

<220>
 <221> MUTAGEN
 <222> 106
 <223> /note= "Xaa at position 106 is Asn,
 Gln, or His"

<220>
 <221> MUTAGEN
 <222> 109
 <223> /note= "Xaa at position 109 is Ala
 or Glu"

<400> 8

```

Asn Cys Ser Xaa Xaa Xaa Asp Glu Xaa Ile Xaa His Leu Lys Xaa Pro
1          5          10          15
Pro Xaa Pro Xaa Leu Asp Xaa Xaa Asn Leu Asn Xaa Glu Asp Xaa Xaa
20          25          30
Ile Leu Xaa Xaa Xaa Asn Leu Arg Xaa Xaa Asn Leu Xaa Xaa Phe Xaa
35          40          45
Xaa Ala Xaa Lys Xaa Leu Xaa Asn Ala Ser Xaa Ile Glu Xaa Ile Leu
50          55          60
Xaa Asn Xaa Xaa Pro Cys Xaa Pro Xaa Xaa Thr Ala Xaa Pro Xaa Arg
65          70          75          80
Xaa Pro Ile Xaa Ile Xaa Xaa Gly Asp Trp Xaa Glu Phe Arg Xaa Lys
85          90          95
Leu Xaa Phe Tyr Leu Xaa Xaa Leu Glu Xaa Ala Gln Xaa Gln Gln
100          105          110

```

<210> 9
 <211> 111
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-111
 <223>

<400> 9

```

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro
1          5          10          15
Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp
20          25          30
Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn
35          40          45
Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser Ile Leu
50          55          60
Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg
65          70          75          80
His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys
85          90          95
Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln
100          105          110

```

<210> 10
 <211> 111

<212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-111
 <223>

<400> 10

```

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro
1          5          10          15
Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp Met Asp
          20          25          30
Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn
          35          40          45
Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser Ile Leu
          50          55          60
Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg
65          70          75          80
His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys
          85          90          95
Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln
          100          105          110

```

<210> 11
 <211> 111
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-111
 <223>

<400> 11

```

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Val Pro
1          5          10          15
Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp Met Asp
          20          25          30
Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn
          35          40          45
Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser Ile Leu
          50          55          60
Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg
65          70          75          80
His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys
          85          90          95
Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln
          100          105          110

```

<210> 12
 <211> 111
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-111
 <223>

<400> 12

```

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro
1          5          10          15
Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp
20        25        30
Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala Phe Val
35        40        45
Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu
50        55        60
Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg
65        70        75        80
His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys
85        90        95
Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln
100       105       110

```

```

<210>    13
<211>    111
<212>    PRT
<213>    Artificial Sequence

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```

<220>
<221>    MUTAGEN
<222>    1-111
<223>

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```

<400>    13

```

```

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro
1          5          10          15
Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp
20        25        30
Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val
35        40        45
Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu
50        55        60
Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg
65        70        75        80
His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys
85        90        95
Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln
100       105       110

```

```

<210>    14
<211>    111
<212>    PRT
<213>    Artificial Sequence

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<220>
<221>    MUTAGEN
<222>    1-111
<223>

```

```

<400>    14

```

```

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro
1          5          10          15
Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp
20        25        30
Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala Phe Val
35        40        45
Arg Ala Val Lys His Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu

```

```

      50              55              60
Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg
65              70              75              80
His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys
85              90              95
Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln
100              105              110

<210>      15
<211>      111
<212>      PRT
<213>      Artificial Sequence

<220>
<221>      MUTAGEN
<222>      1-111
<223>

<400>      15
Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro
1              5              10              15
Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp
20              25              30
Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn
35              40              45
Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu
50              55              60
Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg
65              70              75              80
His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Arg Lys
85              90              95
Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln
100              105              110

<210>      16
<211>      111
<212>      PRT
<213>      Artificial Sequence

<220>
<221>      MUTAGEN
<222>      1-111
<223>

<400>      16
Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro
1              5              10              15
Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp
20              25              30
Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn
35              40              45
Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu
50              55              60
Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg
65              70              75              80
His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Arg Lys
85              90              95
Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln
100              105              110

```


<210> 17
 <211> 111
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-111
 <223>

<400> 17

```

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro
1          5          10          15
Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp
          20          25          30
Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn
          35          40          45
Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser Ile Leu
          50          55          60
Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg
65          70          75          80
His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Glu Lys
          85          90          95
Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln
          100          105          110

```

<210> 18
 <211> 111
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-111
 <223>

<400> 18

```

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro
1          5          10          15
Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp
          20          25          30
Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn
          35          40          45
Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser Ile Leu
          50          55          60
Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg
65          70          75          80
His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Glu Lys
          85          90          95
Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln Gln
          100          105          110

```

<210> 19
 <211> 111
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-111
 <223>

<400> 19

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro
 1 5 10 15
 Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp
 20 25 30
 Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn
 35 40 45
 Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu
 50 55 60
 Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg
 65 70 75 80
 His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
 85 90 95
 Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln
 100 105 110

<210> 20

<211> 111

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-111

<223>

<400> 20

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro
 1 5 10 15
 Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp
 20 25 30
 Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn
 35 40 45
 Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu
 50 55 60
 Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg
 65 70 75 80
 His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
 85 90 95
 Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln
 100 105 110

<210> 21

<211> 111

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-111

<223>

<400> 21

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro
 1 5 10 15
 Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp
 20 25 30
 Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn

35 40 45
 Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala Ile Leu
 50 55 60
 Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg
 65 70 75 80
 His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys
 85 90 95
 Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln Gln
 100 105 110

<210> 22
 <211> 111
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-111
 <223>

<400> 22

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro
 1 5 10 15
 Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp
 20 25 30
 Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val
 35 40 45
 Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu
 50 55 60
 Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg
 65 70 75 80
 His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys
 85 90 95
 Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln
 100 105 110

<210> 23
 <211> 111
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-111
 <223>

<400> 23

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro
 1 5 10 15
 Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp Met Asp
 20 25 30
 Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala Phe Val
 35 40 45
 Arg Ala Val Lys His Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu
 50 55 60
 Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg
 65 70 75 80
 His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys
 85 90 95

Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln
 100 105 110

<210> 24
 <211> 111
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-111
 <223>

<400> 24

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Val Pro
 1 5 10 15

Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp Met Asp
 20 25 30

Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala Phe Val
 35 40 45

Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser Ile Leu
 50 55 60

Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg
 65 70 75 80

His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys
 85 90 95

Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln
 100 105 110

<210> 25
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 25

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala
 50 55 60

Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80

Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95

Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110

Gln

<210> 26
 <211> 113
 <212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-113

<223>

<400> 26

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20           25           30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35           40           45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala
          50           55           60
Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65           70           75           80
Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
          85           90           95
Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
          100          105          110

```

Gln

<210> 27

<211> 113

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-113

<223>

<400> 27

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20           25           30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35           40           45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Gly Ile Glu Ala
          50           55           60
Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65           70           75           80
Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
          85           90           95
Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln
          100          105          110

```

Gln

<210> 28

<211> 113

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-113

<223>

<400> 28

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15

Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp
 20 25 30

Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
 35 40 45

Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 29

<211> 113

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-113

<223>

<400> 29

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15

Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30

Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45

Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 30

<211> 113

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-113

<223>

<400> 30

```

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1           5           10           15
Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp
           20           25           30
Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala
           35           40           45
Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Ala Ile Glu Ser
           50           55           60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65           70           75           80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
           85           90           95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
           100          105          110

```

Gln

```

<210>    31
<211>    113
<212>    PRT
<213>    Artificial Sequence

```

```

<220>
<221>    MUTAGEN
<222>    1-113
<223>

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<400> 31

```

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1           5           10           15
Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp
           20           25           30
Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
           35           40           45
Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
           50           55           60
Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65           70           75           80
Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
           85           90           95
Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
           100          105          110

```

Gln

```

<210>    32
<211>    113
<212>    PRT
<213>    Artificial Sequence

```

```

<220>
<221>    MUTAGEN
<222>    1-113
<223>

```

<400> 32

```

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1           5           10           15

```

Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110

Gln

<210> 33
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 33

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110

Gln

<210> 34
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 34

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp
 20 25 30
 Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser

35 40 45
 Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110

Gln

<210> 35
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 35

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110

Gln

<210> 36
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 36

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60

Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65 70 75 80

Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
85 90 95

Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln
100 105 110

Gln

<210> 37
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-113
<223>

<400> 37

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1 5 10 15

Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn Ser Glu Asp
20 25 30

Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Leu Ala
35 40 45

Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
50 55 60

Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65 70 75 80

Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
85 90 95

Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln
100 105 110

Gln

<210> 38
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-113
<223>

<400> 38

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1 5 10 15

Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
20 25 30

Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
35 40 45

Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
50 55 60

Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65 70 75 80

Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110

Gln

<210> 39
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 39

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp
 20 25 30
 Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
 35 40 45
 Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Val Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Thr Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Ser Leu Glu His Ala Gln Glu Gln
 100 105 110

Gln

<210> 40
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 40

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp
 20 25 30
 Val Asp Ile Leu Met Asp Arg Asn Leu Arg Leu Ser Asn Leu Glu Ser
 35 40 45
 Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln

100 105 110

Gln

<210> 41
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 41

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ala Ile His His Leu Lys
 1 5 10 15

Arg Pro Pro Ala Pro Ser Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp
 20 25 30

Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
 35 40 45

Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60

Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80

Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95

Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110

Gln

<210> 42
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 42

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15

Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp
 20 25 30

Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
 35 40 45

Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60

Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80

Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95

Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110

Gln

<210> 43

<211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 43

```

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1          5          10          15
Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp
          20          25          30
Val Asp Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
          35          40          45
Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
          50          55          60
Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65          70          75          80
Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
          85          90          95
Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
          100          105          110

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Gln

<210> 44
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 44

```

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1          5          10          15
Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp
          20          25          30
Val Ser Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
          35          40          45
Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
          50          55          60
Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65          70          75          80
Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
          85          90          95
Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
          100          105          110

```

Gln

<210> 45
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>

<221> MUTAGEN
 <222> 1-113
 <223>

<400> 45

```

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1          5          10          15
Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp
          20          25          30
Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
          35          40          45
Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
          50          55          60
Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65          70          75          80
Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
          85          90          95
Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
          100          105          110

```

Gln

<210> 46
 <211> 125
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 46

```

Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp Lys Asn Cys
1          5          10          15
Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Ala
          20          25          30
Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu Asp Val Asp Ile Leu
          35          40          45
Met Glu Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser Phe Val Arg Ala
          50          55          60
Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn
65          70          75          80
Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
          85          90          95
Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr
          100          105          110
Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln
          115          120          125

```

<210> 47
 <211> 125
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-125
 <223>

<400> 47

Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp Lys Asn Cys
 1 5 10 15
 Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Asn
 20 25 30
 Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu
 35 40 45
 Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala Phe Val Arg Ala
 50 55 60
 Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn
 65 70 75 80
 Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
 85 90 95
 Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr
 100 105 110
 Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln
 115 120 125

<210> 48
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 48

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Leu Ile His His Leu Lys
 1 5 10 15
 Ile Pro Pro Asn Pro Ser Leu Asp Ser Ala Asn Leu Asn Ser Glu Asp
 20 25 30
 Val Ser Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110

Gln

<210> 49
 <211> 134
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-134
 <223>

<400> 49

Met Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn
 1 5 10 15
 Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys Gln Pro Pro

20 25 30
 Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp Gln Asp Ile
 35 40 45
 Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala Phe Asn Arg
 50 55 60
 Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser Ile Leu Lys
 65 70 75 80
 Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro Thr Arg His
 85 90 95
 Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg Arg Lys Leu
 100 105 110
 Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln Gln Thr Thr
 115 120 125
 Leu Ser Leu Ala Ile Phe
 130

<210> 50
 <211> 36
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-36
 <223>

<400> 50

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 1 5 10 15
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 20 25 30

Gly Gly Gly Ser
 35

<210> 51
 <211> 24
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-24
 <223>

<400> 51

Ile Ser Glu Pro Ser Gly Pro Ile Ser Thr Ile Asn Pro Ser Pro Pro
 1 5 10 15
 Ser Lys Glu Ser His Lys Ser Pro
 20

<210> 52
 <211> 28
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-28
 <223>

<400> 52

Ile Glu Gly Arg Ile Ser Glu Pro Ser Gly Pro Ile Ser Thr Ile Asn
 1 5 10 15

Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser Pro
20 25

<210> 53
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-113
<223>

<400> 53

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln

<210> 54
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-113
<223>

<400> 54

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Asp Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln

<210> 55
<211> 113

<212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 55

```
Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Ser Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110
```

Gln

<210> 56
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 56

```
Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Ile Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110
```

Gln

<210> 57
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113

<223>

<400> 57

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Leu Glu Asp
          20           25           30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35           40           45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50           55           60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65           70           75           80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85           90           95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

```

Gln

```

<210> 58
<211> 113
<212> PRT
<213> Artificial Sequence

```

```

<220>
<221> MUTAGEN
<222> 1-113
<223>

```

<400> 58

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Met Glu Asp
          20           25           30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35           40           45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50           55           60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65           70           75           80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85           90           95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

```

Gln

```

<210> 59
<211> 113
<212> PRT
<213> Artificial Sequence

```

```

<220>
<221> MUTAGEN
<222> 1-113
<223>

```

<400> 59

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15

```

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Tyr Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 60
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 60

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Ala Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 61
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 61

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Val Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 62
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 62

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 63
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 63

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Asn Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln

<210> 64
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-113
<223>

<400> 64

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Ser Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln

<210> 65
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-113
<223>

<400> 65

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Gln Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln

<210> 66
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 66

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln His Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

```

Gln

<210> 67
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 67

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Val Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

```

Gln

<210> 68
 <211> 113
 <212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-113

<223>

<400> 68

```
Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20          25          30
Gln Asp Ile Leu Met Asp Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85          90          95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100         105         110
```

Gln

<210> 69

<211> 113

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-113

<223>

<400> 69

```
Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20          25          30
Gln Asp Ile Leu Met Glu Pro Asn Leu Arg Arg Pro Asn Leu Glu Ala
35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85          90          95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100         105         110
```

Gln

<210> 70

<211> 113

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-113

<223>

<400> 70

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
      20      25      30
Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Arg Pro Asn Leu Glu Ala
      35      40      45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
      50      55      60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
      65      70      75      80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
      85      90      95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
      100      105      110

```

Gln

```

<210> 71
<211> 113
<212> PRT
<213> Artificial Sequence

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<220>
<221> MUTAGEN
<222> 1-113
<223>

```

<400> 71

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
      20      25      30
Gln Asp Ile Leu Met Glu His Asn Leu Arg Arg Pro Asn Leu Glu Ala
      35      40      45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
      50      55      60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
      65      70      75      80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
      85      90      95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
      100      105      110

```

Gln

```

<210> 72
<211> 113
<212> PRT
<213> Artificial Sequence

```

```

<220>
<221> MUTAGEN
<222> 1-113
<223>

```

<400> 72

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15

```

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Thr Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 73
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 73

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Pro Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 74
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 74

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Pro
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 75
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 75

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Val
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 76
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 76

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ala
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Gln

<210> 79
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 79

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Asp Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

```

Gln

<210> 80
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 80

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Asp Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

```

Gln

<210> 81
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-113
<223>

<400> 81
Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60
Ile Leu Lys Asn Leu Glu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln

<210> 82
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-113
<223>

<400> 82
Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60
Ile Leu Lys Asn Leu His Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln

<210> 83
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-113
<223>

<400> 83

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Phe Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 84

<211> 113

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-113

<223>

<400> 84

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Ser Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 85

<211> 113

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-113

<223>

<400> 85

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp

```

                20                25                30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
   35                40                45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
   50                55                60
Ile Leu Lys Asn Leu Tyr Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
   65                70                75                80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
                85                90                95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
                100                105                110

```

Gln

```

<210>      86
<211>      113
<212>      PRT
<213>      Artificial Sequence

```

```

<220>
<221>      MUTAGEN
<222>      1-113
<223>

```

```

<400>      86

```

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1                5                10                15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
                20                25                30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
   35                40                45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
   50                55                60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
   65                70                75                80
Thr Arg Arg Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
                85                90                95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
                100                105                110

```

Gln

```

<210>      87
<211>      113
<212>      PRT
<213>      Artificial Sequence

```

```

<220>
<221>      MUTAGEN
<222>      1-113
<223>

```

```

<400>      87

```

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1                5                10                15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
                20                25                30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
   35                40                45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser

```



```

      50              55              60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65              70              75              80
Thr Arg Thr Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85              90              95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100              105              110

```

Gln

```

<210>      88
<211>      113
<212>      PRT
<213>      Artificial Sequence

```

```

<220>
<221>      MUTAGEN
<222>      1-113
<223>

```

```

<400>      88

```

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1              5              10              15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20              25              30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35              40              45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50              55              60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65              70              75              80
Thr Arg Asn Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85              90              95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100              105              110

```

Gln

```

<210>      89
<211>      113
<212>      PRT
<213>      Artificial Sequence

```

```

<220>
<221>      MUTAGEN
<222>      1-113
<223>

```

```

<400>      89

```

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1              5              10              15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20              25              30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35              40              45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50              55              60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65              70              75              80
Thr Arg Ser Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg

```

85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 90
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 90

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile Ile Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 91
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 91

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile Leu Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 92
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 92

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile Ala Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

```

Gln

<210> 93
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 93

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile Gln Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

```

Gln

<210> 94
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-113

<223>

<400> 94

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile Met Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 95

<211> 113

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-113

<223>

<400> 95

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile Ser Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 96

<211> 113

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-113

<223>

<400> 96

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
           20           25           30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
           35           40           45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
           50           55           60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65           70           75           80
Thr Arg His Pro Ile Tyr Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
           85           90           95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
           100          105          110

```

Gln

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<210> 97
<211> 113
<212> PRT
<213> Artificial Sequence

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<220>
<221> MUTAGEN
<222> 1-113
<223>

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<400> 97

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
           20           25           30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
           35           40           45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
           50           55           60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65           70           75           80
Thr Arg His Pro Ile Val Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
           85           90           95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
           100          105          110

```

Gln

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<210> 98
<211> 113
<212> PRT
<213> Artificial Sequence

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<220>
<221> MUTAGEN
<222> 1-113
<223>

```

<400> 98

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
           20           25           30

```

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Arg Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 99
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 99

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Glu Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 100
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 100

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Pro Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln

<210> 101
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-113
<223>

<400> 101

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys His Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln

<210> 102
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-113
<223>

<400> 102

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asn Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 103
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 103

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Ile Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 104
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 104

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Leu Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 105
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 105

```
Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Pro Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110
```

Gln

<210> 106
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 106

```
Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Ala
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110
```

Gln

<210> 107
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>

<221> MUTAGEN
 <222> 1-113
 <223>

<400> 107

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Ser
          85          90          95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

```

Gln

<210> 108
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 108

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95
Arg Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

```

Gln

<210> 109
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 109

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95
Arg Lys Leu Thr Phe Tyr Leu Trp Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

```

Gln

```

<210> 110
<211> 113
<212> PRT
<213> Artificial Sequence

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<220>
<221> MUTAGEN
<222> 1-113
<223>

```

<400> 110

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95
Arg Lys Leu Thr Phe Tyr Leu Ala Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

```

Gln

```

<210> 111
<211> 113
<212> PRT
<213> Artificial Sequence

```

```

<220>
<221> MUTAGEN
<222> 1-113
<223>

```

<400> 111

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

```

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu His Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 112
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 112

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Phe Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln

<210> 113
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 113

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Tyr Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln

<210> 114
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-113
<223>

<400> 114

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ile Gln Ala Gln
100 105 110

Gln

<210> 115
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-113
<223>

<400> 115

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Ile Ala Gln
 100 105 110

Gln

<210> 116
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 116

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Phe Ala Gln
 100 105 110

Gln

<210> 117
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 117

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Met Gln
 100 105 110

Gln

<210> 118

<211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 118

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
           20           25           30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
           35           40           45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
           50           55           60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65           70           75           80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
           85           90           95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Glu Gln
           100          105          110

```

Gln

<210> 119
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-113
 <223>

<400> 119

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
           20           25           30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
           35           40           45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
           50           55           60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65           70           75           80
Thr Arg His Pro Ile His Ile Lys Ala Gly Asp Trp Asn Glu Phe Arg
           85           90           95
Arg Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Asn Ala Gln Ala Gln
           100          105          110

```

Gln

<210> 120
 <211> 113
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN

<222> 1-113

<223>

<400> 120

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Asp Glu Asp
          20          25          30
Met Ser Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

```

Gln

<210> 121

<211> 307

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-307

<223>

<400> 121

```

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1          5          10          15
Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
          20          25          30
Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
          35          40          45
Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
          50          55          60
Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65          70          75          80
Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
          85          90          95
Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
          100          105          110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
          115          120          125
Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
          130          135          140
Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
145          150          155          160
Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
          165          170          175
Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
          180          185          190

```


Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 122
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 122

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Ser Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala

210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305
 <210> 123
 <211> 307
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

 <400> 123
 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Lys Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Ser Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305
 <210> 124
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 124
 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Glu Gly Gly Gly Gly Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Ser Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
290 295 300

Ala Gln Pro
305

<210> 125
<211> 244
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-244
<223>

<400> 125

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1 5 10 15

Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
20 25 30

Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
35 40 45

Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
50 55 60

Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65 70 75 80

Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
85 90 95

Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
115 120 125

Gly Ser Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
130 135 140

His Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn
145 150 155 160

Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn
165 170 175

Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly
180 185 190

Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr
195 200 205

Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln
210 215 220

Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala
225 230 235 240

Gln Glu Gln Gln

<210> 126
<211> 244
<212> PRT
<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-244

<223>

<400> 126

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15

Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30

Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45

Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60

Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80

Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95

Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Lys Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

Gly Ser Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
 130 135 140

His Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn
 145 150 155 160

Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn
 165 170 175

Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly
 180 185 190

Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr
 195 200 205

Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln
 210 215 220

Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala
 225 230 235 240

Gln Glu Gln Gln

<210> 127

<211> 244

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-244

<223>

<400> 127

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15

Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30

Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45

Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Glu Gly Gly Gly Gly Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
 130 135 140
 His Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn
 145 150 155 160
 Ser Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn
 165 170 175
 Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly
 180 185 190
 Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr
 195 200 205
 Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln
 210 215 220
 Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala
 225 230 235 240
 Gln Glu Gln Gln

<210> 128
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 128

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145 150 155 160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260 265 270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275 280 285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305 310 315 320

Gln Pro

<210> 129
<211> 322
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-322
<223>

<400> 129

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1 5 10 15

Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
20 25 30

Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
35 40 45

Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
50 55 60

Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65 70 75 80

Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
85 90 95

Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
100 105 110

Gln Tyr Val Ile Glu Gly Lys Ile Ser Pro Gly Glu Pro Ser Gly Pro
115 120 125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser

130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 130
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 130

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Glu Gly Gly Gly Gly Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 131
 <211> 259
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-259
 <223>

<400> 131

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140

Pro Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 145 150 155 160
 Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser
 165 170 175
 Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu
 180 185 190
 Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile
 195 200 205
 Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala
 210 215 220
 Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu
 225 230 235 240
 Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln
 245 250 255
 Glu Gln Gln

<210> 132
 <211> 259
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-259
 <223>

<400> 132

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Lys Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 145 150 155 160
 Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser
 165 170 175
 Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu
 180 185 190
 Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile
 195 200 205
 Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala

210	215	220
Ala Pro Ser Arg His	Pro Ile Ile Ile Lys	Ala Gly Asp Trp Gln Glu
225	230	235 240
Phe Arg Glu Lys Leu	Thr Phe Tyr Leu Val Thr	Leu Glu Gln Ala Gln
245	250	255

Glu Gln Gln

<210> 133
 <211> 259
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-259
 <223>

<400> 133

Met Ala Asn Cys Ser	Ile Met Ile Asp	Glu Ile Ile His His	Leu Lys
1	5	10	15
Arg Pro Pro Asn Pro	Leu Leu Asp Pro	Asn Asn Leu Asn Ser	Glu Asp
20	25	30	
Met Asp Ile Leu Met	Glu Arg Asn Leu Arg	Thr Pro Asn Leu Leu	Ala
35	40	45	
Phe Val Arg Ala Val	Lys His Leu Glu Asn	Ala Ser Gly Ile Glu	Ala
50	55	60	
Ile Leu Arg Asn Leu	Gln Pro Cys Leu Pro	Ser Ala Thr Ala Ala	Pro
65	70	75	80
Ser Arg His Pro Ile	Ile Ile Lys Ala Gly	Asp Trp Gln Glu Phe	Arg
85	90	95	
Glu Lys Leu Thr Phe	Tyr Leu Val Thr	Leu Glu Gln Ala Gln	Glu Gln
100	105	110	
Gln Tyr Val Glu Gly	Gly Gly Gly Ser Pro	Gly Glu Pro Ser Gly	Pro
115	120	125	
Ile Ser Thr Ile Asn	Pro Ser Pro Pro Ser	Lys Glu Ser His Lys	Ser
130	135	140	
Pro Asn Met Ala Asn	Cys Ser Ile Met Ile	Asp Glu Ile Ile His	His
145	150	155	160
Leu Lys Arg Pro Pro	Asn Pro Leu Leu Asp	Pro Asn Asn Leu Asn	Ser
165	170	175	
Glu Asp Met Asp Ile	Leu Met Glu Arg Asn	Leu Arg Thr Pro Asn	Leu
180	185	190	
Leu Ala Phe Val Arg	Ala Val Lys His Leu	Glu Asn Ala Ser Gly	Ile
195	200	205	
Glu Ala Ile Leu Arg	Asn Leu Gln Pro Cys	Leu Pro Ser Ala Thr	Ala
210	215	220	
Ala Pro Ser Arg His	Pro Ile Ile Ile Lys	Ala Gly Asp Trp Gln	Glu
225	230	235	240
Phe Arg Glu Lys Leu	Thr Phe Tyr Leu Val	Thr Leu Glu Gln Ala	Gln
245	250	255	

Glu Gln Gln

<210> 134
 <211> 307

<212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

 <400> 134

 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp
 20 25 30
 Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
 35 40 45
 Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

 <210> 135
 <211> 307
 <212> PRT
 <213> Artificial Sequence

 <220>

<221> MUTAGEN

<222> 1-307

<223>

<400> 135

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15

Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp
 20 25 30

Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
 35 40 45

Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60

Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80

Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95

Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140

Ser Phe Leu Leu Lys Ser Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro
 305

<210> 136

<211> 244

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-244

<223>

<400> 136

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1          5          10          15

Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp
          20          25          30

Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
          35          40          45

Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
          50          55          60

Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65          70          75          80

Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
          85          90          95

Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
          115          120          125

Gly Ser Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
130          135          140

His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn
145          150          155          160

Asp Glu Asp Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn
          165          170          175

Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly
          180          185          190

Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr
195          200          205

Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln
210          215          220

Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala
225          230          235          240

Gln Glu Gln Gln

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<210> 137

<211> 259

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-259

<223>

<400> 137

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1          5          10          15

Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp
          20          25          30

Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
          35          40          45

Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
          50          55          60

Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65          70          75          80

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Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 145 150 155 160
 Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp
 165 170 175
 Glu Asp Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu
 180 185 190
 Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile
 195 200 205
 Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala
 210 215 220
 Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu
 225 230 235 240
 Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln
 245 250 255

Glu Gln Gln

<210> 138
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 138

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp
 20 25 30
 Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
 35 40 45
 Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Ser Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 139
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 139

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser

145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 140
 <211> 22
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-22
 <223>

<400> 140

Glu Phe His Ala Tyr Val Glu Gly Gly Gly Gly Ser Pro Gly Gly Gly
 1 5 10 15

Ser Gly Gly Gly Ser Asn
 20

<210> 141
 <211> 259
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-259
 <223>

<400> 141

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15

Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30

Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45

Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Pro Ala Arg Ser Pro Ser Pro Ser Thr Gln Pro
 130 135 140
 Trp Glu His Val Asn Ala Ile Gln Glu Ala Arg Arg Leu Leu Asn Leu
 145 150 155 160
 Ser Arg Asp Thr Ala Ala Glu Met Asn Glu Thr Val Glu Val Ile Ser
 165 170 175
 Glu Met Phe Asp Leu Gln Glu Pro Thr Cys Leu Gln Thr Arg Leu Glu
 180 185 190
 Leu Tyr Lys Gln Gly Leu Arg Gly Ser Leu Thr Lys Leu Lys Gly Pro
 195 200 205
 Leu Thr Met Met Ala Ser His Tyr Lys Gln His Cys Pro Pro Thr Pro
 210 215 220
 Glu Thr Ser Cys Ala Thr Gln Ile Ile Thr Phe Glu Ser Phe Lys Glu
 225 230 235 240
 Asn Leu Lys Asp Phe Leu Leu Val Ile Pro Phe Asp Cys Trp Glu Pro
 245 250 255
 Val Gln Glu

<210> 142
 <211> 301
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-301
 <223>

<400> 142

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Pro
 165 170 175
 Ala Arg Ser Pro Ser Pro Ser Thr Gln Pro Trp Glu His Val Asn Ala
 180 185 190
 Ile Gln Glu Ala Arg Arg Leu Leu Asn Leu Ser Arg Asp Thr Ala Ala
 195 200 205
 Glu Met Asn Glu Thr Val Glu Val Ile Ser Glu Met Phe Asp Leu Gln
 210 215 220
 Glu Pro Thr Cys Leu Gln Thr Arg Leu Glu Leu Tyr Lys Gln Gly Leu
 225 230 235 240
 Arg Gly Ser Leu Thr Lys Leu Lys Gly Pro Leu Thr Met Met Ala Ser
 245 250 255
 His Tyr Lys Gln His Cys Pro Pro Thr Pro Glu Thr Ser Cys Ala Thr
 260 265 270
 Gln Ile Ile Thr Phe Glu Ser Phe Lys Glu Asn Leu Lys Asp Phe Leu
 275 280 285
 Leu Val Ile Pro Phe Asp Cys Trp Glu Pro Val Gln Glu
 290 295 300
 <210> 143
 <211> 335
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-335
 <223>
 <400> 143
 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Pro Val Asn Ala Gly Gly Gly Ser Gly Gly Gly Ser Gly
 115 120 125
 Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly
 130 135 140
 Gly Ser Glu Gly Gly Gly Ser Gly Gly Gly Ser Gly Ser Gly Asn Met

145 150 155 160
 Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu
 165 170 175
 Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu
 180 185 190
 Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu
 195 200 205
 Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser
 210 215 220
 Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His
 225 230 235 240
 Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile
 245 250 255
 Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala
 260 265 270
 Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala
 275 280 285
 Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala
 290 295 300
 Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser
 305 310 315 320
 Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 325 330 335

<210> 144
 <211> 274
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-274
 <223>

<400> 144

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Pro Ala Arg Ser Pro Ser Pro Ser Thr Gln Pro Trp
 145 150 155 160

Glu His Val Asn Ala Ile Gln Glu Ala Arg Arg Leu Leu Asn Leu Ser
 165 170 175
 Arg Asp Thr Ala Ala Glu Met Asn Glu Thr Val Glu Val Ile Ser Glu
 180 185 190
 Met Phe Asp Leu Gln Glu Pro Thr Cys Leu Gln Thr Arg Leu Glu Leu
 195 200 205
 Tyr Lys Gln Gly Leu Arg Gly Ser Leu Thr Lys Leu Lys Gly Pro Leu
 210 215 220
 Thr Met Met Ala Ser His Tyr Lys Gln His Cys Pro Pro Thr Pro Glu
 225 230 235 240
 Thr Ser Cys Ala Thr Gln Ile Ile Thr Phe Glu Ser Phe Lys Glu Asn
 245 250 255
 Leu Lys Asp Phe Leu Leu Val Ile Pro Phe Asp Cys Trp Glu Pro Val
 260 265 270

Gln Glu

<210> 145
 <211> 317
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-317
 <223>

<400> 145

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Pro Val Pro Pro Gly Glu Asp Ser Lys Asp Val
 130 135 140
 Ala Ala Pro His Arg Gln Pro Leu Thr Ser Ser Glu Arg Ile Asp Lys
 145 150 155 160
 Gln Ile Arg Tyr Ile Leu Asp Gly Ile Ser Ala Leu Arg Lys Glu Thr
 165 170 175
 Cys Asn Lys Ser Asn Met Cys Glu Ser Ser Lys Glu Ala Leu Ala Glu
 180 185 190
 Asn Asn Leu Asn Leu Pro Lys Met Ala Glu Lys Asp Gly Cys Phe Gln
 195 200 205

Ser Gly Phe Asn Glu Glu Thr Cys Leu Val Lys Ile Ile Thr Gly Leu
 210 215 220
 Leu Glu Phe Glu Val Tyr Leu Glu Tyr Leu Gln Asn Arg Phe Glu Ser
 225 230 235 240
 Ser Glu Glu Gln Ala Arg Ala Val Gln Met Ser Thr Lys Val Leu Ile
 245 250 255
 Gln Phe Leu Gln Lys Lys Ala Lys Asn Leu Asp Ala Ile Thr Thr Pro
 260 265 270
 Asp Pro Thr Thr Asn Ala Ser Leu Leu Thr Lys Leu Gln Ala Gln Asn
 275 280 285
 Gln Trp Leu Gln Asp Met Thr Thr His Leu Ile Leu Arg Ser Phe Lys
 290 295 300
 Glu Phe Leu Gln Ser Ser Leu Arg Ala Leu Arg Gln Met
 305 310 315
 <210> 146
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 146
 Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu
 1 5 10 15
 Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala
 20 25 30
 Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu
 35 40 45
 Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser
 50 55 60
 Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu
 65 70 75 80
 His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly
 85 90 95
 Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val
 100 105 110
 Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met
 115 120 125
 Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser
 130 135 140
 Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln
 145 150 155 160
 Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 165 170 175
 Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly Gly
 180 185 190
 Ser Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 195 200 205
 Leu Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser
 210 215 220
 Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu

225 230 235 240
 Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile
 245 250 255
 Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala
 260 265 270
 Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu
 275 280 285
 Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln
 290 295 300
 Glu Gln Gln
 305
 <210> 147
 <211> 307
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

 <400> 147
 Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu
 1 5 10 15
 Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala
 20 25 30
 Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu
 35 40 45
 Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser
 50 55 60
 Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu
 65 70 75 80
 His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly
 85 90 95
 Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val
 100 105 110
 Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met
 115 120 125
 Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser
 130 135 140
 Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln
 145 150 155 160
 Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 165 170 175
 Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly Gly
 180 185 190
 Ser Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 195 200 205
 Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp
 210 215 220
 Glu Asp Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu
 225 230 235 240
 Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile
 245 250 255

Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala
260 265 270

Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu
275 280 285

Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln
290 295 300

Glu Gln Gln
305

<210> 148
<211> 337
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-337
<223>

<400> 148

Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu
1 5 10 15

Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala
20 25 30

Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu
35 40 45

Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser
50 55 60

Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu
65 70 75 80

His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly
85 90 95

Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val
100 105 110

Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met
115 120 125

Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser
130 135 140

Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln
145 150 155 160

Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
165 170 175

Tyr Val Pro Gln Pro Pro Val Asn Ala Gly Gly Gly Ser Gly Gly Gly
180 185 190

Ser Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu
195 200 205

Gly Gly Gly Ser Glu Gly Gly Gly Ser Gly Gly Gly Ser Gly Ser Gly
210 215 220

Asp Phe Asp Tyr Glu Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu
225 230 235 240

Ile Ile His His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn
245 250 255

Asn Leu Asn Asp Glu Asp Val Ser Ile Leu Met Asp Arg Asn Leu Arg
260 265 270

Leu Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 275 280 285
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 290 295 300
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 305 310 315 320
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 325 330 335
 Gln

<210> 149
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 149

Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu
 1 5 10 15
 Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala
 20 25 30
 Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu
 35 40 45
 Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser
 50 55 60
 Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu
 65 70 75 80
 His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly
 85 90 95
 Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val
 100 105 110
 Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met
 115 120 125
 Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser
 130 135 140
 Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln
 145 150 155 160
 Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 165 170 175
 Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro Ile
 180 185 190
 Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser Pro
 195 200 205
 Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu
 210 215 220
 Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu
 225 230 235 240
 Asp Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu
 245 250 255
 Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu

260 265 270
 Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala
 275 280 285
 Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe
 290 295 300
 Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu
 305 310 315 320
 Gln Gln
 <210> 150
 <211> 322
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-322
 <223>
 <400> 150
 Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu
 1 5 10 15
 Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala
 20 25 30
 Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu
 35 40 45
 Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser
 50 55 60
 Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu
 65 70 75 80
 His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly
 85 90 95
 Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val
 100 105 110
 Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met
 115 120 125
 Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser
 130 135 140
 Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln
 145 150 155 160
 Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 165 170 175
 Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro Ile
 180 185 190
 Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser Pro
 195 200 205
 Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu
 210 215 220
 Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu
 225 230 235 240
 Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu
 245 250 255
 Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu
 260 265 270

Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala
275 280 285

Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe
290 295 300

Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu
305 310 315 320

Gln Gln

<210> 151
<211> 349
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-349
<223>

<400> 151

Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu
1 5 10 15

Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala
20 25 30

Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu
35 40 45

Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser
50 55 60

Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu
65 70 75 80

His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly
85 90 95

Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val
100 105 110

Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met
115 120 125

Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser
130 135 140

Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln
145 150 155 160

Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
165 170 175

Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala Gly
180 185 190

Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly Ser
195 200 205

Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Gly
210 215 220

Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Asn Cys
225 230 235 240

Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro Asn
245 250 255

Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp Met Asp Ile Leu
260 265 270

Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala Phe Val Arg Ala
 275 280 285
 Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg Asn
 290 295 300
 Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His Pro
 305 310 315 320
 Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr
 325 330 335
 Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln
 340 345

<210> 152
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 152

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp
 20 25 30
 Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
 35 40 45
 Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Glu Gly Gly Gly Gly Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Ser Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala

260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305
 <210> 153
 <211> 244
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-244
 <223>
 <400> 153
 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp
 20 25 30
 Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
 35 40 45
 Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Glu Gly Gly Gly Gly Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
 130 135 140
 His Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn
 145 150 155 160
 Asp Glu Asp Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn
 165 170 175
 Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly
 180 185 190
 Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr
 195 200 205
 Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln
 210 215 220
 Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala
 225 230 235 240
 Gln Glu Gln Gln
 <210> 154
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-322

<223>

<400> 154

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15

Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp
 20 25 30

Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
 35 40 45

Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60

Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80

Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95

Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Gly Gly Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160

Phe Leu Leu Lys Ser Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 155

<211> 259

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN
 <222> 1-259
 <223>

<400> 155

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Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1          5          10          15
Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu Asp
          20          25          30
Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu Ser
          35          40          45
Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu Ala
50          55          60
Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65          70          75          80
Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
          85          90          95
Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
          100          105          110
Gln Tyr Val Glu Gly Gly Gly Gly Ser Pro Gly Glu Pro Ser Gly Pro
          115          120          125
Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
          130          135          140
Pro Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
145          150          155          160
Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp
          165          170          175
Glu Asp Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu
          180          185          190
Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile
          195          200          205
Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala
210          215          220
Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu
225          230          235          240
Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln
          245          250          255

Glu Gln Gln

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<210> 156
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 156

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Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu
1          5          10          15
Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala
          20          25          30
Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu

```

35 40 45
 Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser
 50 55 60
 Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gly Leu
 65 70 75 80
 His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly
 85 90 95
 Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val
 100 105 110
 Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met
 115 120 125
 Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser
 130 135 140
 Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln
 145 150 155 160
 Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 165 170 175
 Tyr Val Glu Gly Gly Gly Gly Ser Pro Gly Glu Pro Ser Gly Pro Ile
 180 185 190
 Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser Pro
 195 200 205
 Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu
 210 215 220
 Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu
 225 230 235 240
 Asp Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu
 245 250 255
 Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu
 260 265 270
 Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala
 275 280 285
 Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe
 290 295 300
 Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu
 305 310 315 320
 Gln Gln

<210> 157
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 157

Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu
 1 5 10 15
 Leu Lys Ser Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala
 20 25 30
 Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu
 35 40 45

Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser
 50 55 60
 Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gly Leu
 65 70 75 80
 His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly
 85 90 95
 Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val
 100 105 110
 Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met
 115 120 125
 Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser
 130 135 140
 Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln
 145 150 155 160
 Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 165 170 175
 Tyr Val Glu Gly Gly Gly Gly Ser Pro Gly Glu Pro Ser Gly Pro Ile
 180 185 190
 Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser Pro
 195 200 205
 Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu
 210 215 220
 Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp Glu
 225 230 235 240
 Asp Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu Glu
 245 250 255
 Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile Glu
 260 265 270
 Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala
 275 280 285
 Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe
 290 295 300
 Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu
 305 310 315 320
 Gln Gln

<210> 158
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 158

Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu
 1 5 10 15
 Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala
 20 25 30
 Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu
 35 40 45

Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser
 50 55 60
 Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gly Leu
 65 70 75 80
 His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly
 85 90 95
 Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val
 100 105 110
 Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met
 115 120 125
 Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser
 130 135 140
 Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln
 145 150 155 160
 Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 165 170 175
 Tyr Val Glu Gly Gly Gly Gly Ser Pro Gly Gly Gly Ser Gly Gly Gly
 180 185 190
 Ser Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 195 200 205
 Leu Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Asp
 210 215 220
 Glu Asp Val Ser Ile Leu Met Asp Arg Asn Leu Arg Leu Pro Asn Leu
 225 230 235 240
 Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly Ile
 245 250 255
 Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala
 260 265 270
 Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu
 275 280 285
 Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln
 290 295 300
 Glu Gln Gln
 305
 <210> 159
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 159
 Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu
 1 5 10 15
 Leu Lys Ser Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala
 20 25 30
 Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu
 35 40 45
 Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser
 50 55 60
 Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gly Leu

65	70							75							80		
His	Ser	Gly	Leu	Phe 85	Leu	Tyr	Gln	Gly	Leu 90	Leu	Gln	Ala	Leu	Glu 95	Gly		
Ile	Ser	Pro	Glu 100	Leu	Gly	Pro	Thr	Leu 105	Asp	Thr	Leu	Gln	Leu 110	Asp	Val		
Ala	Asp	Phe 115	Ala	Thr	Thr	Ile	Trp 120	Gln	Gln	Met	Glu	Glu 125	Leu	Gly	Met		
Ala	Pro	Ala	Leu	Gln	Pro	Thr 135	Gln	Gly	Ala	Met	Pro 140	Ala	Phe	Ala	Ser		
Ala	Phe	Gln	Arg	Arg	Ala 150	Gly	Gly	Val	Leu	Val 155	Ala	Ser	His	Leu	Gln 160		
Ser	Phe	Leu	Glu	Val 165	Ser	Tyr	Arg	Val	Leu 170	Arg	His	Leu	Ala	Gln 175	Pro		
Tyr	Val	Glu	Gly 180	Gly	Gly	Gly	Ser	Pro 185	Gly	Gly	Gly	Ser	Gly 190	Gly	Gly		
Ser	Asn	Met 195	Ala	Asn	Cys	Ser	Ile 200	Met	Ile	Asp	Glu	Ile 205	Ile	His	His		
Leu	Lys	Arg	Pro	Pro	Ala 215	Pro	Leu	Leu	Asp	Pro 220	Asn	Asn	Leu	Asn	Asp		
Glu	Asp	Val	Ser	Ile 230	Leu	Met	Asp	Arg	Asn	Leu 235	Arg	Leu	Pro	Asn	Leu 240		
Glu	Ser	Phe	Val	Arg 245	Ala	Val	Lys	Asn	Leu 250	Glu	Asn	Ala	Ser	Gly 255	Ile		
Glu	Ala	Ile	Leu 260	Arg	Asn	Leu	Gln	Pro 265	Cys	Leu	Pro	Ser	Ala 270	Thr	Ala		
Ala	Pro	Ser 275	Arg	His	Pro	Ile	Ile 280	Ile	Lys	Ala	Gly	Asp 285	Trp	Gln	Glu		
Phe	Arg 290	Glu	Lys	Leu	Thr	Phe 295	Tyr	Leu	Val	Thr	Leu 300	Glu	Gln	Ala	Gln		
Glu 305	Gln	Gln															
<210>		160															
<211>		128															
<212>		PRT															
<213>		Human															
<400>		160															
Met 1	Ala	Pro	Ala	Arg 5	Ser	Pro	Ser	Pro	Ser 10	Thr	Gln	Pro	Trp	Glu 15	His		
Val	Asn	Ala	Ile 20	Gln	Glu	Ala	Arg	Arg 25	Leu	Leu	Asn	Leu 30	Ser	Arg	Asp		
Thr	Ala	Ala 35	Glu	Met	Asn	Glu	Thr 40	Val	Glu	Val	Ile	Ser 45	Glu	Met	Phe		
Asp	Leu 50	Gln	Glu	Pro	Thr 55	Cys	Leu	Gln	Thr	Arg	Leu 60	Glu	Leu	Tyr	Lys		
Gln 65	Gly	Leu	Arg	Gly	Ser 70	Leu	Thr	Lys	Leu	Lys 75	Gly	Pro	Leu	Thr	Met 80		
Met	Ala	Ser	His	Tyr 85	Lys	Gln	His	Cys	Pro 90	Pro	Thr	Pro	Glu	Thr 95	Ser		
Cys	Ala	Thr	Gln 100	Ile	Ile	Thr	Phe	Glu 105	Ser	Phe	Lys	Glu	Asn 110	Leu	Lys		
Asp	Phe	Leu	Leu	Val	Ile	Pro	Phe	Asp	Cys	Trp	Glu	Pro	Val	Gln	Glu		

115 120 125

<210> 161
 <211> 176
 <212> PRT
 <213> Human
 <400> 161

Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu
 1 5 10 15

Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala
 20 25 30

Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu
 35 40 45

Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser
 50 55 60

Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu
 65 70 75 80

His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly
 85 90 95

Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val
 100 105 110

Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met
 115 120 125

Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser
 130 135 140

Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln
 145 150 155 160

Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 165 170 175

<210> 162
 <211> 176
 <212> PRT
 <213> Human
 <400> 162

Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu
 1 5 10 15

Leu Lys Ser Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala
 20 25 30

Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu
 35 40 45

Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser
 50 55 60

Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu
 65 70 75 80

His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly
 85 90 95

Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val
 100 105 110

Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met
 115 120 125

Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser
 130 135 140

Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln
145 150 155 160

Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
165 170 175

<210> 163
<211> 186
<212> PRT
<213> Human

<400> 163

Met Ala Pro Val Pro Pro Gly Glu Asp Ser Lys Asp Val Ala Ala Pro
1 5 10 15

His Arg Gln Pro Leu Thr Ser Ser Glu Arg Ile Asp Lys Gln Ile Arg
20 25 30

Tyr Ile Leu Asp Gly Ile Ser Ala Leu Arg Lys Glu Thr Cys Asn Lys
35 40 45

Ser Asn Met Cys Glu Ser Ser Lys Glu Ala Leu Ala Glu Asn Asn Leu
50 55 60

Asn Leu Pro Lys Met Ala Glu Lys Asp Gly Cys Phe Gln Ser Gly Phe
65 70 75 80

Asn Glu Glu Thr Cys Leu Val Lys Ile Ile Thr Gly Leu Leu Glu Phe
85 90 95

Glu Val Tyr Leu Glu Tyr Leu Gln Asn Arg Phe Glu Ser Ser Glu Glu
100 105 110

Gln Ala Arg Ala Val Gln Met Ser Thr Lys Val Leu Ile Gln Phe Leu
115 120 125

Gln Lys Lys Ala Lys Asn Leu Asp Ala Ile Thr Thr Pro Asp Pro Thr
130 135 140

Thr Asn Ala Ser Leu Leu Thr Lys Leu Gln Ala Gln Asn Gln Trp Leu
145 150 155 160

Gln Asp Met Thr Thr His Leu Ile Leu Arg Ser Phe Lys Glu Phe Leu
165 170 175

Gln Ser Ser Leu Arg Ala Leu Arg Gln Met
180 185

<210> 164
<211> 155
<212> PRT
<213> Human

<400> 164

Met Ala Ser Pro Ala Pro Pro Ala Cys Asp Leu Arg Val Leu Ser Lys
1 5 10 15

Leu Leu Arg Asp Ser His Val Leu His Ser Arg Leu Ser Gln Cys Pro
20 25 30

Glu Val His Pro Leu Pro Thr Pro Val Leu Leu Pro Ala Val Asp Phe
35 40 45

Ser Leu Gly Glu Trp Lys Thr Gln Met Glu Glu Thr Lys Ala Gln Asp
50 55 60

Ile Leu Gly Ala Val Thr Leu Leu Leu Glu Gly Val Met Ala Ala Arg
65 70 75 80

Gln Gln Leu Gly Pro Thr Cys Leu Ser Ser Leu Leu Gly Gln Leu Ser
85 90 95

Gly Gln Val Arg Leu Leu Leu Gly Ala Leu Gln Ser Leu Leu Gly Thr
100 105 110

Gln Leu Pro Pro Gln Gly Arg Thr Thr Ala His Lys Asp Pro Asn Ala
 115 120 125
 Ile Phe Leu Ser Phe Gln His Leu Leu Arg Gly Lys Val Arg Phe Leu
 130 135 140
 Met Leu Val Gly Gly Ser Thr Leu Cys Val Arg
 145 150 155
 <210> 165
 <211> 286
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-286
 <223>
 <400> 165
 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 1 5 10 15
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
 35 40 45
 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
 50 55 60
 Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
 65 70 75 80
 Ser Arg His Pro Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
 85 90 95
 Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Ser Pro Ala Pro Pro Ala Cys Asp Leu Arg Val
 130 135 140
 Leu Ser Lys Leu Leu Arg Asp Ser His Val Leu His Ser Arg Leu Ser
 145 150 155 160
 Gln Cys Pro Glu Val His Pro Leu Pro Thr Pro Val Leu Leu Pro Ala
 165 170 175
 Val Asp Phe Ser Leu Gly Glu Trp Lys Thr Gln Met Glu Glu Thr Lys
 180 185 190
 Ala Gln Asp Ile Leu Gly Ala Val Thr Leu Leu Leu Glu Gly Val Met
 195 200 205
 Ala Ala Arg Gln Gln Leu Gly Pro Thr Cys Leu Ser Ser Leu Leu Gly
 210 215 220
 Gln Leu Ser Gly Gln Val Arg Leu Leu Leu Gly Ala Leu Gln Ser Leu
 225 230 235 240
 Leu Gly Thr Gln Leu Pro Pro Gln Gly Arg Thr Thr Ala His Lys Asp
 245 250 255
 Pro Asn Ala Ile Phe Leu Ser Phe Gln His Leu Leu Arg Gly Lys Val
 260 265 270
 Arg Phe Leu Met Leu Val Gly Gly Ser Thr Leu Cys Val Arg
 275 280 285

<210> 166
 <211> 286
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-286
 <223>

<400> 166

```

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
1          5          10          15

Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp
          20          25          30

Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala
          35          40          45

Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala
          50          55          60

Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro
65          70          75          80

Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg
          85          90          95

Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln
          100          105          110

Gln Tyr Val Glu Gly Gly Gly Gly Ser Pro Gly Gly Gly Ser Gly Gly
          115          120          125

Gly Ser Asn Met Ala Ser Pro Ala Pro Pro Ala Cys Asp Leu Arg Val
          130          135          140

Leu Ser Lys Leu Leu Arg Asp Ser His Val Leu His Ser Arg Leu Ser
145          150          155          160

Gln Cys Pro Glu Val His Pro Leu Pro Thr Pro Val Leu Leu Pro Ala
          165          170          175

Val Asp Phe Ser Leu Gly Glu Trp Lys Thr Gln Met Glu Glu Thr Lys
          180          185          190

Ala Gln Asp Ile Leu Gly Ala Val Thr Leu Leu Leu Glu Gly Val Met
          195          200          205

Ala Ala Arg Gln Gln Leu Gly Pro Thr Cys Leu Ser Ser Leu Leu Gly
210          215          220

Gln Leu Ser Gly Gln Val Arg Leu Leu Leu Gly Ala Leu Gln Ser Leu
225          230          235          240

Leu Gly Thr Gln Leu Pro Pro Gln Gly Arg Thr Thr Ala His Lys Asp
          245          250          255

Pro Asn Ala Ile Phe Leu Ser Phe Gln His Leu Leu Arg Gly Lys Val
          260          265          270

Arg Phe Leu Met Leu Val Gly Gly Ser Thr Leu Cys Val Arg
          275          280          285

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<210> 167
 <211> 286
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-286
 <223>

<400> 167

Met Ala Ser Pro Ala Pro Pro Ala Cys Asp Leu Arg Val Leu Ser Lys
 1 5 10 15
 Leu Leu Arg Asp Ser His Val Leu His Ser Arg Leu Ser Gln Cys Pro
 20 25 30
 Glu Val His Pro Leu Pro Thr Pro Val Leu Leu Pro Ala Val Asp Phe
 35 40 45
 Ser Leu Gly Glu Trp Lys Thr Gln Met Glu Glu Thr Lys Ala Gln Asp
 50 55 60
 Ile Leu Gly Ala Val Thr Leu Leu Leu Glu Gly Val Met Ala Ala Arg
 65 70 75 80
 Gln Gln Leu Gly Pro Thr Cys Leu Ser Ser Leu Leu Gly Gln Leu Ser
 85 90 95
 Gly Gln Val Arg Leu Leu Leu Gly Ala Leu Gln Ser Leu Leu Gly Thr
 100 105 110
 Gln Leu Pro Pro Gln Gly Arg Thr Thr Ala His Lys Asp Pro Asn Ala
 115 120 125
 Ile Phe Leu Ser Phe Gln His Leu Leu Arg Gly Lys Val Arg Phe Leu
 130 135 140
 Met Leu Val Gly Gly Ser Thr Leu Cys Val Arg Tyr Val Ile Glu Gly
 145 150 155 160
 Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly Gly Ser Asn Met Ala Asn
 165 170 175
 Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys Arg Pro Pro
 180 185 190
 Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu Asp Met Asp Ile
 195 200 205
 Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu Ala Phe Val Arg
 210 215 220
 Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu Ala Ile Leu Arg
 225 230 235 240
 Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala Pro Ser Arg His
 245 250 255
 Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe Arg Glu Lys Leu
 260 265 270
 Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu Gln Gln
 275 280 285

<210> 168

<211> 290

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-290

<223>

<400> 168

Met Ala Ser Pro Ala Pro Pro Ala Cys Asp Leu Arg Val Leu Ser Lys
 1 5 10 15
 Leu Leu Arg Asp Ser His Val Leu His Ser Arg Leu Ser Gln Cys Pro
 20 25 30
 Glu Val His Pro Leu Pro Thr Pro Val Leu Leu Pro Ala Val Asp Phe
 35 40 45

Ser Leu Gly Glu Trp Lys Thr Gln Met Glu Glu Thr Lys Ala Gln Asp
 50 55 60
 Ile Leu Gly Ala Val Thr Leu Leu Leu Glu Gly Val Met Ala Ala Arg
 65 70 75 80
 Gln Gln Leu Gly Pro Thr Cys Leu Ser Ser Leu Leu Gly Gln Leu Ser
 85 90 95
 Gly Gln Val Arg Leu Leu Leu Gly Ala Leu Gln Ser Leu Leu Gly Thr
 100 105 110
 Gln Leu Pro Pro Gln Gly Arg Thr Thr Ala His Lys Asp Pro Asn Ala
 115 120 125
 Ile Phe Leu Ser Phe Gln His Leu Leu Arg Gly Lys Val Arg Phe Leu
 130 135 140
 Met Leu Val Gly Gly Ser Thr Leu Cys Val Arg Glu Phe His Ala Tyr
 145 150 155 160
 Val Glu Gly Gly Gly Gly Ser Pro Gly Gly Gly Ser Gly Gly Gly Ser
 165 170 175
 Asn Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu
 180 185 190
 Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu
 195 200 205
 Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu Leu
 210 215 220
 Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly Ile Glu
 225 230 235 240
 Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala Thr Ala Ala
 245 250 255
 Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp Trp Gln Glu Phe
 260 265 270
 Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Gln Ala Gln Glu
 275 280 285

Gln Gln
290

<210> 169
 <211> 18
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-18
 <223>

<400> 169

Met Ser Arg Leu Pro Val Leu Leu Leu Leu Gln Leu Leu Val Arg Pro
 1 5 10 15

Ala Met

<210> 170
 <211> 18
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-18
 <223>

<400> 170

Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly Gly
1 5 10 15

Ser Asn

<210> 171

<211> 18

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-18

<223>

<400> 171

Tyr Val Ile Glu Gly Lys Ile Ser Pro Gly Gly Gly Ser Gly Gly Gly
1 5 10 15

Ser Asn

<210> 172

<211> 18

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-18

<223>

<400> 172

Tyr Val Glu Gly Gly Gly Gly Ser Pro Gly Gly Gly Ser Gly Gly Gly
1 5 10 15

Ser Asn

<210> 173

<211> 33

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-33

<223>

<400> 173

Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro Ile
1 5 10 15

Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser Pro
20 25 30

Asn

<210> 174

<211> 33

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-33

<223>

<400> 174

Tyr Val Ile Glu Gly Lys Ile Ser Pro Gly Glu Pro Ser Gly Pro Ile
1 5 10 15

Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser Pro
20 25 30

Asn

<210> 175

<211> 33

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-33

<223>

<400> 175

Tyr Val Glu Gly Gly Gly Ser Pro Gly Glu Pro Ser Gly Pro Ile
1 5 10 15

Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser Pro
20 25 30

Asn

<210> 176

<211> 49

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-49

<223>

<400> 176

Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly Gly
1 5 10 15

Ser Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu
20 25 30

Gly Gly Gly Ser Glu Gly Gly Gly Ser Gly Gly Gly Ser Gly Ser Gly
35 40 45

Asn

<210> 177

<211> 60

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-60

<223>

<400> 177

Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala Gly
1 5 10 15

Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly Ser
20 25 30

Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Gly

35 40 45
 Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn
 50 55 60

 <210> 178
 <211> 307
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

 <400> 178

 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Asp Glu Asp
 20 25 30

 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140

 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160

 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190

 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205

 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220

 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240

 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285

 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

 Ala Gln Pro
 305

<210> 179
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 179

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Asp Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
          115          120          125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130          135          140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145          150          155          160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
          165          170          175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
          180          185          190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
          195          200          205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210          215          220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225          230          235          240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
          245          250          255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
          260          265          270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
          275          280          285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290          295          300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305          310          315          320

Gln Pro
```

<210> 180
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 180

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Asp Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
          115          120          125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130          135          140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145          150          155          160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
          165          170          175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
          180          185          190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
          195          200          205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210          215          220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225          230          235          240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
          245          250          255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
          260          265          270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
          275          280          285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
290          295          300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305          310          315          320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
          325          330          335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro

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340 345

<210> 181
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 181

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Ser Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro
 305

<210> 182
 <211> 322

<212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 182

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Ser Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
          115          120          125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
          130          135          140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
          145          150          155          160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
          165          170          175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
          180          185          190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
          195          200          205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
          210          215          220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
          225          230          235          240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
          245          250          255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
          260          265          270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
          275          280          285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
          290          295          300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
          305          310          315          320

Gln Pro

```

<210> 183
 <211> 349
 <212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-349

<223>

<400> 183

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Ser Glu Asp
20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100         105         110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
115         120         125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130         135         140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145         150         155         160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
165         170         175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
180         185         190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
195         200         205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210         215         220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225         230         235         240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
245         250         255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
260         265         270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
275         280         285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
290         295         300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305         310         315         320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
325         330         335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
340         345

```

<210> 184

<211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 184

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Ile Glu Asp
          20           25           30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35           40           45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50           55           60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65           70           75           80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85           90           95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
          115          120          125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
          130          135          140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
145          150          155          160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
          165          170          175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
          180          185          190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
          195          200          205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
          210          215          220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
225          230          235          240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
          245          250          255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
          260          265          270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
          275          280          285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
          290          295          300

Ala Gln Pro
305

```

<210> 185
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-322

<223>

<400> 185

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Ile Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
115 120 125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145 150 155 160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260 265 270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275 280 285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305 310 315 320

Gln Pro

<210> 186

<211> 349

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN
 <222> 1-349
 <223>

<400> 186

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Ile Glu Asp
20      25      30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35      40      45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50      55      60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65      70      75      80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85      90      95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100     105     110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
115     120     125
Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130     135     140
Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145     150     155     160
Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
165     170     175
Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
180     185     190
Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
195     200     205
Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210     215     220
Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225     230     235     240
Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
245     250     255
Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
260     265     270
Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
275     280     285
Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
290     295     300
Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305     310     315     320
Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
325     330     335
Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
340     345

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<210> 187
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

 <400> 187
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Leu Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

 <210> 188
 <211> 322
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-322

<223>

<400> 188

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Leu Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 189

<211> 349

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-349

<223>

<400> 189

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Leu Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 190

<211> 307

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-307

<223>

<400> 190

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Met Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro
 305

<210> 191

<211> 322

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-322

<223>

<400> 191

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Met Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 192
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 192

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Met Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 193
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 193

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Tyr Glu Asp
20      25      30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35      40      45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50      55      60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65      70      75      80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85      90      95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100     105     110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
115     120     125
Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
130     135     140
Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
145     150     155     160
Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
165     170     175
Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
180     185     190
Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
195     200     205
Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
210     215     220
Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
225     230     235     240
Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
245     250     255
Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
260     265     270
Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
275     280     285
His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
290     295     300
Ala Gln Pro
305

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<210> 194

<211> 322

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-322

<223>

<400> 194

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15

```

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Tyr Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 195
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 195

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Tyr Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 196
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 196

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys

```

1           5           10           15
Gln Prô Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Ala Glu Asp
20           25           30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35           40           45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50           55           60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65           70           75           80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85           90           95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100          105          110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
115          120          125
Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
130          135          140
Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
145          150          155          160
Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
165          170          175
Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
180          185          190
Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
195          200          205
Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
210          215          220
Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
225          230          235          240
Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
245          250          255
Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
260          265          270
Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
275          280          285
His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
290          295          300
Ala Gln Pro
305
<210>      197
<211>      322
<212>      PRT
<213>      Artificial Sequence

<220>
<221>      MUTAGEN
<222>      1-322
<223>

<400>      197
Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Ala Glu Asp
20           25           30

```

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 198
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 198

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Ala Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 199
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 199

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp

20 25 30
 Val Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305
 <210> 200
 <211> 322
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-322
 <223>
 <400> 200
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Val Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 201
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 201

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Val Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 202
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 202

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala

35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305
 <210> 203
 <211> 322
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-322
 <223>
 <400> 203
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 204
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 204

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 205
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 205

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser

50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305
 <210> 206
 <211> 322
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-322
 <223>

 <400> 206
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 207
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 207

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 208
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 208
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Asn Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro

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Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 210
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 210

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Asn Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 211
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 211
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Ser Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg

85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 212
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 212

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Ser Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln

100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 213
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 213

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Ser Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 214
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 214

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Gln Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 215
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 215

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Gln Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 216
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 216

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Gln Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala

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      115              120              125
Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130              135              140
Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145              150              155              160
Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165              170              175
Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180              185              190
Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195              200              205
Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210              215              220
Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225              230              235              240
Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245              250              255
Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260              265              270
Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275              280              285
Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290              295              300
Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305              310              315              320
Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325              330              335
Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340              345

<210>      217
<211>      307
<212>      PRT
<213>      Artificial Sequence

<220>
<221>      MUTAGEN
<222>      1-307
<223>

<400>      217
Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1              5              10              15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20              25              30
Gln His Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35              40              45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50              55              60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65              70              75              80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85              90              95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100             105             110

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Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305
 <210> 218
 <211> 322
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-322
 <223>
 <400> 218
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln His Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 219
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 219

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln His Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly

130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

 <210> 220
 <211> 307
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

 <400> 220
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Val Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro
305

<210> 221
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 221

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Val Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 222
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 222

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Val Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser

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Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 224
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 224

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Asp Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser

145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 225
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 225

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Asp Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 226
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 226

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Asp Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 227
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 227

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Asp Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 228
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 228

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Asp Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

 <210> 229
 <211> 307
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

 <400> 229

 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Pro Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp

145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 230
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 230

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Pro Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 231
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 231

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Pro Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr

	165		170		175
Pro Leu Gly	Pro Ala Ser Ser Leu	Pro Gln Ser Phe Leu Leu Lys Ser			
	180	185		190	
Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu					
	195	200		205	
Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu					
	210	215		220	
Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro					
	225	230		235	240
Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly					
	245	250		255	
Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro					
	260	265		270	
Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe					
	275	280		285	
Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala					
	290	295		300	
Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln					
	305	310		315	320
Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu					
	325	330		335	
Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro					
	340	345			
<210>	232				
<211>	307				
<212>	PRT				
<213>	Artificial Sequence				
<220>					
<221>	MUTAGEN				
<222>	1-307				
<223>					
<400>	232				
Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys					
1	5	10		15	
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp					
	20	25		30	
Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Arg Pro Asn Leu Glu Ala					
	35	40		45	
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser					
	50	55		60	
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro					
	65	70		75	80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg					
	85	90		95	
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln					
	100	105		110	
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly					
	115	120		125	
Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln					
	130	135		140	
Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp					
	145	150		155	160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 233
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 233

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly

165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 234
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 234

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
275 280 285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
290 295 300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305 310 315 320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
325 330 335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
340 345

<210> 235
<211> 307
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-307
<223>

<400> 235

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu His Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
130 135 140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
145 150 155 160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 236
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 236

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu His Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260 265 270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275 280 285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305 310 315 320

Gln Pro

<210> 237
<211> 349
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-349
<223>

<400> 237

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu His Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
115 120 125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130 135 140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145 150 155 160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
165 170 175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 238
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 238

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Thr Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His

165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 239
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 239

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Thr Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180 185 190
Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195 200 205
Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210 215 220
Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225 230 235 240
Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245 250 255
Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260 265 270
Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275 280 285
Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290 295 300
Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305 310 315 320

Gln Pro

<210> 240
<211> 349
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-349
<223>

<400> 240

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30
Gln Asp Ile Leu Met Glu Thr Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
115 120 125
Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130 135 140
Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145 150 155 160
Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
165 170 175
Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser

180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 241
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 241
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Pro Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 242
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 242

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Pro Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro

180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 243
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 243

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Pro Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 244
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 244

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Pro
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 245
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 245

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Pro
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro

180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 246
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 246

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Pro
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 247
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 247
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Val
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 248
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 248

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Val
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 249
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 249

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Val
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 250
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 250
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ala
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala

180				185				190							
Pro	Leu	Ser	Cys	Pro	Ser	Gln	Ala	Leu	Gln	Leu	Ala	Gly	Cys	Leu	
195				200				205							
Ser	Gln	Leu	His	Ser	Gly	Leu	Phe	Leu	Tyr	Gln	Gly	Leu	Leu	Gln	
210				215				220							
Leu	Glu	Gly	Ile	Ser	Pro	Glu	Leu	Gly	Pro	Thr	Leu	Asp	Thr	Gln	
225				230				235				240			
Leu	Asp	Val	Ala	Asp	Phe	Ala	Thr	Thr	Ile	Trp	Gln	Gln	Met	Glu	
				245				250				255			
Leu	Gly	Met	Ala	Pro	Ala	Leu	Gln	Pro	Thr	Gln	Gly	Ala	Met	Pro	
				260				265				270			
Phe	Ala	Ser	Ala	Phe	Gln	Arg	Arg	Ala	Gly	Gly	Val	Leu	Val	Ala	
275				280				285							
His	Leu	Gln	Ser	Phe	Leu	Glu	Val	Ser	Tyr	Arg	Val	Leu	Arg	His	
290				295				300							
Ala	Gln	Pro													
305															

<210>	251
<211>	322
<212>	PRT
<213>	Artificial Sequence

<220>	
<221>	MUTAGEN
<222>	1-322
<223>	

<400> 251

Met 1	Ala	Asn	Cys	Ser 5	Asn	Met	Ile	Asp	Glu 10	Ile	Ile	Thr	His	Leu 15	Lys
Gln	Pro	Pro	Leu 20	Pro	Leu	Leu	Asp	Phe 25	Asn	Asn	Leu	Asn	Gly 30	Glu	Asp
Gln	Asp	Ile 35	Leu	Met	Glu	Asn	Asn 40	Leu	Arg	Arg	Pro	Asn 45	Leu	Glu	Ala
Phe 50	Asn	Arg	Ala	Val	Lys	Ser 55	Leu	Gln	Asn	Ala	Ser 60	Ala	Ile	Glu	Ala
Ile 65	Leu	Lys	Asn	Leu	Leu 70	Pro	Cys	Leu	Pro	Leu 75	Ala	Thr	Ala	Ala	Pro 80
Thr	Arg	His	Pro	Ile 85	His	Ile	Lys	Asp	Gly 90	Asp	Trp	Asn	Glu	Phe 95	Arg
Arg	Lys	Leu	Thr 100	Phe	Tyr	Leu	Lys	Thr 105	Leu	Glu	Asn	Ala	Gln 110	Ala	Gln
Gln	Tyr	Val 115	Ile	Glu	Gly	Arg	Ile 120	Ser	Pro	Gly	Glu	Pro 125	Ser	Gly	Pro
Ile 130	Ser	Thr	Ile	Asn	Pro	Ser 135	Pro	Pro	Ser	Lys 140	Glu	Ser	His	Lys	Ser
Pro 145	Asn	Met	Ala	Thr	Pro 150	Leu	Gly	Pro	Ala	Ser 155	Ser	Leu	Pro	Gln	Ser 160
Phe	Leu	Leu	Lys 165	Cys	Leu	Glu	Gln	Val 170	Arg	Lys	Ile	Gln	Gly	Asp 175	Gly
Ala	Ala	Leu 180	Gln	Glu	Lys	Leu	Cys 185	Ala	Thr	Tyr	Lys	Leu	Cys 190	His	Pro

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 252
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 252

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ala
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu

195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

 <210> 253
 <211> 307
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

 <400> 253

 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Leu Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 254
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 254

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Leu Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro

195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 255
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 255

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Leu Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 256
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 256
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Trp Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 257
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 257

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Trp Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 258
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 258

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Trp Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 259
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 259
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Asp Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu

195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 260
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 260

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Asp Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 261
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 261

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Asp Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu

210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

 <210> 262
 <211> 307
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

 <400> 262

 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Asn Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 263
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 263

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Asn Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser

210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 264
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 264

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Asn Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 265
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 265
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Glu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 266
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 266

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Glu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 267
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 267

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Glu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 268
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 268
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu His Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala

210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 269
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 269

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu His Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 270
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 270

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu His Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro

225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

 <210> 271
 <211> 307
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

 <400> 271

 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Phe Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 272
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 272

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Phe Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu

225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 273
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 273

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Phe Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 274
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 274

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Ser Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 275
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 275

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Ser Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 276
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 276

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Ser Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 277
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 277
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Tyr Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln

225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 278
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 278

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Tyr Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 279
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 279

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Tyr Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly


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      245      250      255
Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
      260      265      270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
      275      280      285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
      290      295      300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
      305      310      315      320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
      325      330      335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
      340      345

<210>      280
<211>      307
<212>      PRT
<213>      Artificial Sequence

<220>
<221>      MUTAGEN
<222>      1-307
<223>

<400>      280

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
      20      25      30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
      35      40      45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
      50      55      60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
      65      70      75      80

Thr Arg Arg Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
      85      90      95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
      100      105      110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
      115      120      125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
      130      135      140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
      145      150      155      160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
      165      170      175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
      180      185      190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
      195      200      205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
      210      215      220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
      225      230      235      240

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<210>      281
<211>      322
<212>      PRT
<213>      Artificial Sequence

<220>
<221>      MUTAGEN
<222>      1-322
<223>

<400>      281

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245/348

245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

 <210> 282
 <211> 349
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-349
 <223>

 <400> 282
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg Arg Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 283
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 283
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg Thr Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro
 305

<210> 284
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 284

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg Thr Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 285
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 285

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg Thr Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 286
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 286
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg Asn Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu

245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 287
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 287

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg Asn Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 288
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 288

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg Asn Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro

260					265					270						
Glu	Leu	Gly	Pro	Thr	Leu	Asp	Thr	Leu	Gln	Leu	Asp	Val	Ala	Asp	Phe	
		275					280					285				
Ala	Thr	Thr	Ile	Trp	Gln	Gln	Met	Glu	Glu	Leu	Gly	Met	Ala	Pro	Ala	
		290					295					300				
Leu	Gln	Pro	Thr	Gln	Gly	Ala	Met	Pro	Ala	Phe	Ala	Ser	Ala	Phe	Gln	
		305					310					315				
Arg	Arg	Ala	Gly	Gly	Val	Leu	Val	Ala	Ser	His	Leu	Gln	Ser	Phe	Leu	
				325							330					
Glu	Val	Ser	Tyr	Arg	Val	Leu	Arg	His	Leu	Ala	Gln	Pro				
				340					345							
<210>		289														
<211>		307														
<212>		PRT														
<213>		Artificial		Sequence												
<220>																
<221>		MUTAGEN														
<222>		1-307														
<223>																
<400>		289														
Met	Ala	Asn	Cys	Ser	Asn	Met	Ile	Asp	Glu	Ile	Ile	Thr	His	Leu	Lys	
1			5					10					15			
Gln	Pro	Pro	Leu	Pro	Leu	Leu	Asp	Phe	Asn	Asn	Leu	Asn	Gly	Glu	Asp	
		20						25					30			
Gln	Asp	Ile	Leu	Met	Glu	Asn	Asn	Leu	Arg	Arg	Pro	Asn	Leu	Glu	Ala	
		35						40					45			
Phe	Asn	Arg	Ala	Val	Lys	Ser	Leu	Gln	Asn	Ala	Ser	Ala	Ile	Glu	Ser	
		50						55					60			
Ile	Leu	Lys	Asn	Leu	Leu	Pro	Cys	Leu	Pro	Leu	Ala	Thr	Ala	Ala	Pro	
65							70					75			80	
Thr	Arg	Ser	Pro	Ile	His	Ile	Lys	Asp	Gly	Asp	Trp	Asn	Glu	Phe	Arg	
				85					90					95		
Arg	Lys	Leu	Thr	Phe	Tyr	Leu	Lys	Thr	Leu	Glu	Asn	Ala	Gln	Ala	Gln	
		100						105					110			
Gln	Tyr	Val	Ile	Glu	Gly	Arg	Ile	Ser	Pro	Gly	Gly	Gly	Ser	Gly	Gly	
		115						120					125			
Gly	Ser	Asn	Met	Ala	Thr	Pro	Leu	Gly	Pro	Ala	Ser	Ser	Leu	Pro	Gln	
		130						135					140			
Ser	Phe	Leu	Leu	Lys	Cys	Leu	Glu	Gln	Val	Arg	Lys	Ile	Gln	Gly	Asp	
								150					155			
Gly	Ala	Ala	Leu	Gln	Glu	Lys	Leu	Cys	Ala	Thr	Tyr	Lys	Leu	Cys	His	
								165					170			
Pro	Glu	Glu	Leu	Val	Leu	Leu	Gly	His	Ser	Leu	Gly	Ile	Pro	Trp	Ala	
		180						185					190			
Pro	Leu	Ser	Ser	Cys	Pro	Ser	Gln	Ala	Leu	Gln	Leu	Ala	Gly	Cys	Leu	
		195						200					205			
Ser	Gln	Leu	His	Ser	Gly	Leu	Phe	Leu	Tyr	Gln	Gly	Leu	Leu	Gln	Ala	
		210						215					220			
Leu	Glu	Gly	Ile	Ser	Pro	Glu	Leu	Gly	Pro	Thr	Leu	Asp	Thr	Leu	Gln	
								230					235			
Leu	Asp	Val	Ala	Asp	Phe	Ala	Thr	Thr	Ile	Trp	Gln	Gln	Met	Glu	Glu	
								245					250			

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 290
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 290

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg Ser Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu

260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

 <210> 291
 <211> 349
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-349
 <223>

 <400> 291

 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg Ser Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 292
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 292
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Ile Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
290 295 300

Ala Gln Pro
305

<210> 293
<211> 322
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-322
<223>

<400> 293

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile Ile Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
115 120 125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145 150 155 160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu

260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

 <210> 294
 <211> 349
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-349
 <223>

 <400> 294
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 295
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 295
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Leu Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 296
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 296

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Leu Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275 280 285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305 310 315 320

Gln Pro

<210> 297
<211> 349
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-349
<223>

<400> 297

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile Leu Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
115 120 125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130 135 140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145 150 155 160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
165 170 175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 298
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 298
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Ala Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala

260	265	270
Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser		
275	280	285
His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu		
290	295	300
Ala Gln Pro		
305		
<210>	299	
<211>	322	
<212>	PRT	
<213>	Artificial Sequence	
<220>		
<221>	MUTAGEN	
<222>	1-322	
<223>		
<400>	299	
Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys		
1	5	10 15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp		
	20	25 30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala		
	35	40 45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser		
	50	55 60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro		
65	70	75 80
Thr Arg His Pro Ile Ala Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg		
	85	90 95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln		
	100	105 110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro		
	115	120 125
Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser		
	130	135 140
Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser		
145	150	155 160
Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly		
	165	170 175
Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro		
	180	185 190
Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro		
	195	200 205
Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser		
	210	215 220
Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu		
225	230	235 240
Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu		
	245	250 255
Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu		
	260	265 270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275 280 285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305 310 315 320

Gln Pro

<210> 300
<211> 349
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-349
<223>

<400> 300

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile Ala Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
115 120 125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130 135 140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145 150 155 160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
165 170 175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe

275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

 <210> 301
 <211> 307
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

 <400> 301
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Gln Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
290 295 300

Ala Gln Pro
305

<210> 302
<211> 322
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-322
<223>

<400> 302

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile Gln Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
115 120 125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145 150 155 160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260 265 270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe

275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro
 <210> 303
 <211> 349
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-349
 <223>
 <400> 303
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Gln Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 304
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 304
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Met Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
290 295 300

Ala Gln Pro
305

<210> 305
<211> 322
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-322
<223>

<400> 305

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile Met Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
115 120 125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145 150 155 160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260 265 270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275 280 285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305 310 315 320

Gln Pro

<210> 306
<211> 349
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-349
<223>

<400> 306

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile Met Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
115 120 125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130 135 140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145 150 155 160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
165 170 175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
275 280 285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 307
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 307
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Ser Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser

275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

 <210> 308
 <211> 322
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-322
 <223>

 <400> 308
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Ser Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305 310 315 320

Gln Pro

<210> 309
<211> 349
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-349
<223>

<400> 309

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile Ser Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
115 120 125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130 135 140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145 150 155 160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
165 170 175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
275 280 285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala

290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

 <210> 310
 <211> 307
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

 <400> 310

 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Tyr Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro
 305

<210> 311
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 311

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Tyr Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His

290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

 <210> 312
 <211> 349
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-349
 <223>

 <400> 312

 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Tyr Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305 310 315 320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
325 330 335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
340 345

<210> 313
<211> 307
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-307
<223>

<400> 313

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile Val Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
130 135 140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
145 150 155 160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
180 185 190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
195 200 205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
210 215 220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
225 230 235 240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro
 305

<210> 314
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 314

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile Val Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 315
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 315

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile Val Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305 310 315 320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
325 330 335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
340 345

<210> 316
<211> 307
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-307
<223>

<400> 316

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Arg Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
130 135 140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
145 150 155 160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
180 185 190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
195 200 205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
210 215 220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
225 230 235 240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu

290 295 300

Ala Gln Pro
305

<210> 317
<211> 322
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-322
<223>

<400> 317

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Arg Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
115 120 125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145 150 155 160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260 265 270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275 280 285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 318
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 318

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Arg Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln

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Ala Gln Pro
305

<210> 320
<211> 322
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-322
<223>

<400> 320

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Glu Asp Gly Asp Trp Asn Glu Phe Arg
85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
100         105         110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
115         120         125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130         135         140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145         150         155         160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165         170         175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180         185         190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195         200         205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210         215         220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225         230         235         240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245         250         255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260         265         270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275         280         285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290         295         300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala

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Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 322
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 322
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Pro Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro
305

<210> 323
<211> 322
<212> PRT
<213> Artificial Sequence

<220>
<221> MUTAGEN
<222> 1-322
<223>

<400> 323

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Pro Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
          115          120          125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
          130          135          140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145          150          155          160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
          165          170          175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
          180          185          190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
          195          200          205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
          210          215          220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225          230          235          240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
          245          250          255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
          260          265          270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
          275          280          285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
          290          295          300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305          310          315          320

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Gln Pro

<210> 324
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 324

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Pro Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
          115          120          125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130          135          140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145          150          155          160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
          165          170          175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
          180          185          190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
          195          200          205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210          215          220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225          230          235          240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
          245          250          255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
          260          265          270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
          275          280          285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
290          295          300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305          310          315          320

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Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 325
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 325

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys His Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro

305

<210> 326
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 326

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
      20      25      30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
      35      40      45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
      50      55      60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
      65      70      75      80

Thr Arg His Pro Ile His Ile Lys His Gly Asp Trp Asn Glu Phe Arg
      85      90      95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
      100     105     110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
      115     120     125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
      130     135     140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
      145     150     155     160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
      165     170     175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
      180     185     190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
      195     200     205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
      210     215     220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
      225     230     235     240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
      245     250     255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
      260     265     270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
      275     280     285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
      290     295     300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
      305     310     315     320

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Gln Pro

<210> 327
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 327

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys His Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu

325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 328
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 328
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asn Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 329
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 329

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
      20      25      30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
      35      40      45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
      50      55      60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
      65      70      75      80

Thr Arg His Pro Ile His Ile Lys Asn Gly Asp Trp Asn Glu Phe Arg
      85      90      95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
      100     105     110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
      115     120     125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
      130     135     140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
      145     150     155     160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
      165     170     175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
      180     185     190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
      195     200     205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
      210     215     220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
      225     230     235     240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
      245     250     255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
      260     265     270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
      275     280     285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
      290     295     300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
      305     310     315     320

Gln Pro
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<210> 330
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 330

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asn Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
          115          120          125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130          135          140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145          150          155          160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
          165          170          175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
          180          185          190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
          195          200          205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210          215          220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225          230          235          240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
          245          250          255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
          260          265          270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
          275          280          285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
290          295          300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305          310          315          320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
          325          330          335

```

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

 <210> 331
 <211> 307
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

 <400> 331

 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

 Thr Arg His Pro Ile His Ile Lys Ile Gly Asp Trp Asn Glu Phe Arg
 85 90 95

 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140

 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160

 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190

 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205

 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220

 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240

 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285

 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

 Ala Gln Pro
 305

<210> 332
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 332

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Ile Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100         105         110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
          115         120         125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130         135         140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145         150         155         160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
          165         170         175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
          180         185         190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
          195         200         205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210         215         220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225         230         235         240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
          245         250         255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
          260         265         270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
          275         280         285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290         295         300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305         310         315         320

Gln Pro
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<210> 333
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 333

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Ile Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
          115          120          125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130          135          140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145          150          155          160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
          165          170          175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
          180          185          190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
          195          200          205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210          215          220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225          230          235          240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
          245          250          255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
          260          265          270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
          275          280          285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
          290          295          300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305          310          315          320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
          325          330          335

```

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 334
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 334

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Leu Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro
 305

<210> 335
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 335

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Leu Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
          115          120          125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
          130          135          140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145          150          155          160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
          165          170          175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
          180          185          190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
          195          200          205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
          210          215          220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225          230          235          240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
          245          250          255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
          260          265          270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
          275          280          285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
          290          295          300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305          310          315          320

Gln Pro

```


<210> 336
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 336

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Leu Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
          115          120          125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130          135          140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145          150          155          160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
          165          170          175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
          180          185          190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
          195          200          205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210          215          220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225          230          235          240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
          245          250          255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
          260          265          270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
          275          280          285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
290          295          300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305          310          315          320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
          325          330          335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro

```

340
 345
 <210> 337
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 337
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Pro Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 338
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 338

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Pro Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 339

<211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 339

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Pro Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
          115          120          125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130          135          140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145          150          155          160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
          165          170          175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
          180          185          190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
          195          200          205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210          215          220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225          230          235          240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
          245          250          255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
          260          265          270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
          275          280          285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
          290          295          300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305          310          315          320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
          325          330          335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
          340          345

```

<210> 340
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 340

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Ala
          85          90          95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
          115          120          125
Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
          130          135          140
Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
145          150          155          160
Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
          165          170          175
Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
          180          185          190
Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
          195          200          205
Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
          210          215          220
Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
225          230          235          240
Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
          245          250          255
Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
          260          265          270
Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
          275          280          285
His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
          290          295          300
Ala Gln Pro
305

```

<210> 341

<211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 341

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
          65          70          75          80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Ala
          85          90          95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100         105         110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
          115         120         125
Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
          130         135         140
Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
          145         150         155         160
Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
          165         170         175
Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
          180         185         190
Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
          195         200         205
Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
          210         215         220
Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
          225         230         235         240
Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
          245         250         255
Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
          260         265         270
Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
          275         280         285
Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
          290         295         300
Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
          305         310         315         320
Gln Pro

```

<210> 342
 <211> 349

<212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 342

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
      20      25      30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
      35      40      45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
      50      55      60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65      70      75      80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Ala
      85      90      95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
      100      105      110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
      115      120      125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
      130      135      140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145      150      155      160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
      165      170      175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
      180      185      190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
      195      200      205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
      210      215      220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225      230      235      240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
      245      250      255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
      260      265      270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
      275      280      285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
      290      295      300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305      310      315      320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
      325      330      335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
      340      345

```

<210> 343
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 343

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Ser
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 344
 <211> 322

<212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 344

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Ser
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
          115          120          125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
          130          135          140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
          145          150          155          160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
          165          170          175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
          180          185          190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
          195          200          205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
          210          215          220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
          225          230          235          240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
          245          250          255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
          260          265          270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
          275          280          285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
          290          295          300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
          305          310          315          320

Gln Pro

```

<210> 345
 <211> 349
 <212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-349

<223>

<400> 345

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
      20      25      30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
      35      40      45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
      50      55      60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
      65      70      75      80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Ser
      85      90      95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
      100      105      110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
      115      120      125
Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
      130      135      140
Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
      145      150      155      160
Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
      165      170      175
Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
      180      185      190
Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
      195      200      205
Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
      210      215      220
Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
      225      230      235      240
Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
      245      250      255
Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
      260      265      270
Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
      275      280      285
Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
      290      295      300
Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
      305      310      315      320
Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
      325      330      335
Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
      340      345

```

<210> 346

<211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 346

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20           25           30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35           40           45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50           55           60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65           70           75           80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85           90           95

Arg Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
          115          120          125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
          130          135          140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
145          150          155          160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
          165          170          175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
          180          185          190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
          195          200          205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
          210          215          220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
225          230          235          240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
          245          250          255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
          260          265          270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
          275          280          285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
          290          295          300

Ala Gln Pro
305

```

<210> 347
 <211> 322
 <212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-322

<223>

<400> 347

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20     25     30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35     40     45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50     55     60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65     70     75     80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85     90     95
Arg Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Asn Ala Gln Ala Gln
100    105    110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
115    120    125
Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130    135    140
Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145    150    155    160
Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165    170    175
Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180    185    190
Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195    200    205
Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210    215    220
Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225    230    235    240
Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245    250    255
Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260    265    270
Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275    280    285
Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290    295    300
Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305    310    315    320
Gln Pro

```

<210> 348

<211> 349

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-349

<223>

<400> 348

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 349

<211> 307

<212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 349

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Trp Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
          115          120          125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
          130          135          140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
145          150          155          160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
          165          170          175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
          180          185          190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
          195          200          205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
          210          215          220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
225          230          235          240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
          245          250          255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
          260          265          270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
          275          280          285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
          290          295          300

Ala Gln Pro
305

```

<210> 350
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-322

<223>

<400> 350

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Trp Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 351

<211> 349

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-349

<223>

<400> 351

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Trp Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
115 120 125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130 135 140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145 150 155 160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
165 170 175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
275 280 285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
290 295 300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305 310 315 320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
325 330 335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
340 345

<210> 352

<211> 307

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-307

<223>

<400> 352

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu Ala Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
          115          120          125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
          130          135          140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
          145          150          155          160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
          165          170          175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
          180          185          190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
          195          200          205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
          210          215          220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
          225          230          235          240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
          245          250          255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
          260          265          270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
          275          280          285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
          290          295          300

Ala Gln Pro
305

```

<210> 353

<211> 322

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-322

<223>

<400> 353

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85 90 95

Arg Lys Leu Thr Phe Tyr Leu Ala Thr Leu Glu Asn Ala Gln Ala Gln
100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
115 120 125

Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130 135 140

Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145 150 155 160

Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165 170 175

Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180 185 190

Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195 200 205

Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210 215 220

Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225 230 235 240

Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245 250 255

Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260 265 270

Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275 280 285

Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290 295 300

Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305 310 315 320

Gln Pro

<210> 354

<211> 349

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN
 <222> 1-349
 <223>

<400> 354

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95
Arg Lys Leu Thr Phe Tyr Leu Ala Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
          115          120          125
Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130          135          140
Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145          150          155          160
Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
          165          170          175
Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
          180          185          190
Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
          195          200          205
Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210          215          220
Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225          230          235          240
Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
          245          250          255
Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
          260          265          270
Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
          275          280          285
Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
          290          295          300
Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305          310          315          320
Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
          325          330          335
Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
          340          345

```

<210> 355
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-307

<223>

<400> 355

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu His Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro
 305

<210> 356

<211> 322

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN
 <222> 1-322
 <223>

<400> 356

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95
Arg Lys Leu Thr Phe Tyr Leu His Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
          115          120          125
Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
          130          135          140
Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145          150          155          160
Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
          165          170          175
Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
          180          185          190
Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
          195          200          205
Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
          210          215          220
Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225          230          235          240
Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
          245          250          255
Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
          260          265          270
Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
          275          280          285
Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
          290          295          300
Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305          310          315          320
Gln Pro

```

<210> 357
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN

<222> 1-349

<223>

<400> 357

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50          55          60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95

Arg Lys Leu Thr Phe Tyr Leu His Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
          115          120          125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130          135          140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145          150          155          160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
          165          170          175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
          180          185          190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
          195          200          205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210          215          220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225          230          235          240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
          245          250          255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
          260          265          270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
          275          280          285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
290          295          300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305          310          315          320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
          325          330          335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
          340          345

```

<210> 358

<211> 307

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-307

<223>

<400> 358

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Phe Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro
 305

<210> 359

<211> 322

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-322

<223>

<400> 359

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20      25      30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35      40      45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50      55      60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65      70      75      80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85      90      95
Arg Lys Leu Thr Phe Tyr Leu Phe Thr Leu Glu Asn Ala Gln Ala Gln
100     105     110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
115     120     125
Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130     135     140
Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145     150     155     160
Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165     170     175
Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180     185     190
Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195     200     205
Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210     215     220
Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225     230     235     240
Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245     250     255
Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260     265     270
Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275     280     285
Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290     295     300
Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305     310     315     320
Gln Pro

```

<210> 360

<211> 349

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-349

<223>

<400> 360

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20           25           30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35           40           45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50           55           60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65           70           75           80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85           90           95

Arg Lys Leu Thr Phe Tyr Leu Phe Thr Leu Glu Asn Ala Gln Ala Gln
100          105          110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
115          120          125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
130          135          140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
145          150          155          160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
165          170          175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
180          185          190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
195          200          205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
210          215          220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
225          230          235          240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
245          250          255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
260          265          270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
275          280          285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
290          295          300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
305          310          315          320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
325          330          335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
340          345

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<210> 361

<211> 307

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN
 <222> 1-307
 <223>

<400> 361

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
          20          25          30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
          35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
          50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
          85          90          95
Arg Lys Leu Thr Phe Tyr Leu Tyr Thr Leu Glu Asn Ala Gln Ala Gln
          100          105          110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
          115          120          125
Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
          130          135          140
Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
145          150          155          160
Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
          165          170          175
Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
          180          185          190
Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
          195          200          205
Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
          210          215          220
Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
225          230          235          240
Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
          245          250          255
Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
          260          265          270
Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
          275          280          285
His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
          290          295          300
Ala Gln Pro
305

```

<210> 362
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322

<223>

<400> 362

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1          5          10          15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20          25          30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35          40          45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50          55          60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65          70          75          80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85          90          95
Arg Lys Leu Thr Phe Tyr Leu Tyr Thr Leu Glu Asn Ala Gln Ala Gln
100         105         110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
115         120         125
Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130         135         140
Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145         150         155         160
Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165         170         175
Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180         185         190
Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195         200         205
Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210         215         220
Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225         230         235         240
Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245         250         255
Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260         265         270
Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275         280         285
Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290         295         300
Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305         310         315         320
Gln Pro

```

<210> 363

<211> 349

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-349

<223>

<400> 363

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Tyr Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125

Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140

Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160

Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175

Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190

Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205

Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220

Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240

Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255

Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270

Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285

Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300

Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320

Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335

Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 364
 <211> 307
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN

<222> 1-307

<223>

<400> 364

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ile Gln Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro
 305

<210> 365

<211> 322

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-322

<223>

<400> 365

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20     25     30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35     40     45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50     55     60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65     70     75     80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85     90     95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ile Gln Ala Gln
100    105    110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
115    120    125
Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130    135    140
Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145    150    155    160
Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165    170    175
Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180    185    190
Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195    200    205
Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210    215    220
Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225    230    235    240
Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245    250    255
Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260    265    270
Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275    280    285
Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290    295    300
Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305    310    315    320
Gln Pro

```

<210> 366

<211> 349

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-349

<223>

<400> 366

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ile Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345

<210> 367

<211> 307

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-307

<223>

<400> 367

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30

Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45

Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60

Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80

Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95

Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Ile Ala Gln
 100 105 110

Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125

Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140

Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160

Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175

Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190

Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205

Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220

Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240

Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255

Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270

Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285

His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300

Ala Gln Pro
 305

<210> 368

<211> 322

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-322

<223>

<400> 368

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20      25      30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35      40      45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50      55      60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65      70      75      80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85      90      95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Ile Ala Gln
100     105     110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
115     120     125
Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130     135     140
Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145     150     155     160
Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165     170     175
Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180     185     190
Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195     200     205
Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210     215     220
Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225     230     235     240
Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245     250     255
Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260     265     270
Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275     280     285
Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290     295     300
Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305     310     315     320
Gln Pro

```

<210> 369

<211> 349

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-349

<223>

<400> 369

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Ile Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 370
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 370

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Phe Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 371

<211> 322

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-322

<223>

<400> 371

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1      5      10      15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
20      25      30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
35      40      45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
50      55      60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
65      70      75      80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
85      90      95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Phe Ala Gln
100     105     110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
115     120     125
Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
130     135     140
Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
145     150     155     160
Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
165     170     175
Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
180     185     190
Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
195     200     205
Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
210     215     220
Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
225     230     235     240
Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
245     250     255
Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
260     265     270
Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
275     280     285
Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
290     295     300
Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
305     310     315     320

```

Gln Pro

```

<210> 372
<211> 349
<212> PRT
<213> Artificial Sequence

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<220>
<221> MUTAGEN
<222> 1-349
<223>

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```

<400> 372

```

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Phe Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 373
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>

<400> 373

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Met Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 374

<211> 322

<212> PRT

<213> Artificial Sequence

<220>

<221> MUTAGEN

<222> 1-322

<223>

<400> 374

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Met Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 375
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 375

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys

1	5	10	15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp	20	25	30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala	35	40	45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser	50	55	60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro	65	70	75
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg	85	90	95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Met Gln	100	105	110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala	115	120	125
Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly	130	135	140
Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser	145	150	155
Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr	165	170	175
Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser	180	185	190
Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu	195	200	205
Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu	210	215	220
Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro	225	230	235
Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly	245	250	255
Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro	260	265	270
Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe	275	280	285
Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala	290	295	300
Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln	305	310	315
Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu	325	330	335
Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro	340	345	
<210>	376		
<211>	307		
<212>	PRT		
<213>	Artificial Sequence		
<220>			
<221>	MUTAGEN		
<222>	1-307		
<223>			
<400>	376		

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Glu Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 377
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 377

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys

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1           5           10           15
Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
      20      25      30
Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
      35      40      45
Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
      50      55      60
Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
      65      70      75      80
Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
      85      90      95
Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Glu Gln
      100      105      110
Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
      115      120      125
Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
      130      135      140
Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
      145      150      155      160
Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
      165      170      175
Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
      180      185      190
Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
      195      200      205
Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
      210      215      220
Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
      225      230      235      240
Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
      245      250      255
Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
      260      265      270
Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
      275      280      285
Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
      290      295      300
Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
      305      310      315      320

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Gln Pro

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<210> 378
<211> 349
<212> PRT
<213> Artificial Sequence

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<220>
<221> MUTAGEN
<222> 1-349
<223>

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<400> 378

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
1           5           10           15

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342/348

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Ala Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

<210> 380
 <211> 322
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-322
 <223>

<400> 380

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Ala Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320
 Gln Pro

<210> 381
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 381

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Gly Glu Asp
 20 25 30
 Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Ala Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Val Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gln Pro Pro Val Asn Ala
 115 120 125
 Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly
 130 135 140
 Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser
 145 150 155 160
 Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Asn Met Ala Thr
 165 170 175
 Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser Phe Leu Leu Lys Ser
 180 185 190
 Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly Ala Ala Leu Gln Glu
 195 200 205
 Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro Glu Glu Leu Val Leu
 210 215 220
 Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro Leu Ser Ser Cys Pro
 225 230 235 240
 Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser Gln Leu His Ser Gly
 245 250 255
 Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu Glu Gly Ile Ser Pro
 260 265 270
 Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu Asp Val Ala Asp Phe
 275 280 285
 Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu Gly Met Ala Pro Ala
 290 295 300
 Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe Ala Ser Ala Phe Gln
 305 310 315 320
 Arg Arg Ala Gly Gly Val Leu Val Ala Ser His Leu Gln Ser Phe Leu
 325 330 335
 Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala Gln Pro
 340 345
 <210> 382
 <211> 307
 <212> PRT
 <213> Artificial Sequence
 <220>
 <221> MUTAGEN
 <222> 1-307
 <223>
 <400> 382

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys

1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Asp Glu Asp
 20 25 30
 Met Ser Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Gly Gly Ser Gly Gly
 115 120 125
 Gly Ser Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln
 130 135 140
 Ser Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp
 145 150 155 160
 Gly Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His
 165 170 175
 Pro Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala
 180 185 190
 Pro Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu
 195 200 205
 Ser Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala
 210 215 220
 Leu Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln
 225 230 235 240
 Leu Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu
 245 250 255
 Leu Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala
 260 265 270
 Phe Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser
 275 280 285
 His Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu
 290 295 300
 Ala Gln Pro
 305

 <210> 383
 <211> 322
 <212> PRT
 <213> Artificial Sequence

 <220>
 <221> MUTAGEN
 <222> 1-322
 <223>

 <400> 383
 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15

Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Asp Glu Asp
 20 25 30
 Met Ser Ile Leu Met Glu Asn Asn Leu Arg Arg Pro Asn Leu Glu Ala
 35 40 45
 Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala Ser Ala Ile Glu Ser
 50 55 60
 Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro Leu Ala Thr Ala Ala Pro
 65 70 75 80
 Thr Arg His Pro Ile His Ile Lys Asp Gly Asp Trp Asn Glu Phe Arg
 85 90 95
 Arg Lys Leu Thr Phe Tyr Leu Lys Thr Leu Glu Asn Ala Gln Ala Gln
 100 105 110
 Gln Tyr Val Ile Glu Gly Arg Ile Ser Pro Gly Glu Pro Ser Gly Pro
 115 120 125
 Ile Ser Thr Ile Asn Pro Ser Pro Pro Ser Lys Glu Ser His Lys Ser
 130 135 140
 Pro Asn Met Ala Thr Pro Leu Gly Pro Ala Ser Ser Leu Pro Gln Ser
 145 150 155 160
 Phe Leu Leu Lys Cys Leu Glu Gln Val Arg Lys Ile Gln Gly Asp Gly
 165 170 175
 Ala Ala Leu Gln Glu Lys Leu Cys Ala Thr Tyr Lys Leu Cys His Pro
 180 185 190
 Glu Glu Leu Val Leu Leu Gly His Ser Leu Gly Ile Pro Trp Ala Pro
 195 200 205
 Leu Ser Ser Cys Pro Ser Gln Ala Leu Gln Leu Ala Gly Cys Leu Ser
 210 215 220
 Gln Leu His Ser Gly Leu Phe Leu Tyr Gln Gly Leu Leu Gln Ala Leu
 225 230 235 240
 Glu Gly Ile Ser Pro Glu Leu Gly Pro Thr Leu Asp Thr Leu Gln Leu
 245 250 255
 Asp Val Ala Asp Phe Ala Thr Thr Ile Trp Gln Gln Met Glu Glu Leu
 260 265 270
 Gly Met Ala Pro Ala Leu Gln Pro Thr Gln Gly Ala Met Pro Ala Phe
 275 280 285
 Ala Ser Ala Phe Gln Arg Arg Ala Gly Gly Val Leu Val Ala Ser His
 290 295 300
 Leu Gln Ser Phe Leu Glu Val Ser Tyr Arg Val Leu Arg His Leu Ala
 305 310 315 320

Gln Pro

<210> 384
 <211> 349
 <212> PRT
 <213> Artificial Sequence

<220>
 <221> MUTAGEN
 <222> 1-349
 <223>

<400> 384

Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His Leu Lys
 1 5 10 15
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn Asp Glu Asp

20					25					30					
Met	Ser	Ile	Leu	Met	Glu	Asn	Asn	Leu	Arg	Arg	Pro	Asn	Leu	Glu	Ala
	35						40					45			
Phe	Asn	Arg	Ala	Val	Lys	Ser	Leu	Gln	Asn	Ala	Ser	Ala	Ile	Glu	Ser
	50					55					60				
Ile	Leu	Lys	Asn	Leu	Leu	Pro	Cys	Leu	Pro	Leu	Ala	Thr	Ala	Ala	Pro
	65					70					75				80
Thr	Arg	His	Pro	Ile	His	Ile	Lys	Asp	Gly	Asp	Trp	Asn	Glu	Phe	Arg
				85					90					95	
Arg	Lys	Leu	Thr	Phe	Tyr	Leu	Lys	Thr	Leu	Glu	Asn	Ala	Gln	Ala	Gln
			100					105					110		
Gln	Tyr	Val	Ile	Glu	Gly	Arg	Ile	Ser	Pro	Gln	Pro	Pro	Val	Asn	Ala
		115					120					125			
Gly	Gly	Gly	Ser	Gly	Gly	Gly	Ser	Gly	Gly	Gly	Ser	Glu	Gly	Gly	Gly
	130					135					140				
Ser	Glu	Gly	Gly	Gly	Ser	Glu	Gly	Gly	Gly	Ser	Glu	Gly	Gly	Gly	Ser
	145					150					155				160
Gly	Gly	Gly	Ser	Gly	Ser	Gly	Asp	Phe	Asp	Tyr	Glu	Asn	Met	Ala	Thr
			165						170					175	
Pro	Leu	Gly	Pro	Ala	Ser	Ser	Leu	Pro	Gln	Ser	Phe	Leu	Leu	Lys	Ser
			180					185					190		
Leu	Glu	Gln	Val	Arg	Lys	Ile	Gln	Gly	Asp	Gly	Ala	Ala	Leu	Gln	Glu
		195					200					205			
Lys	Leu	Cys	Ala	Thr	Tyr	Lys	Leu	Cys	His	Pro	Glu	Glu	Leu	Val	Leu
	210					215					220				
Leu	Gly	His	Ser	Leu	Gly	Ile	Pro	Trp	Ala	Pro	Leu	Ser	Ser	Cys	Pro
	225					230					235				240
Ser	Gln	Ala	Leu	Gln	Leu	Ala	Gly	Cys	Leu	Ser	Gln	Leu	His	Ser	Gly
			245					250					255		
Leu	Phe	Leu	Tyr	Gln	Gly	Leu	Leu	Gln	Ala	Leu	Glu	Gly	Ile	Ser	Pro
		260						265					270		
Glu	Leu	Gly	Pro	Thr	Leu	Asp	Thr	Leu	Gln	Leu	Asp	Val	Ala	Asp	Phe
	275						280					285			
Ala	Thr	Thr	Ile	Trp	Gln	Gln	Met	Glu	Glu	Leu	Gly	Met	Ala	Pro	Ala
	290						295				300				
Leu	Gln	Pro	Thr	Gln	Gly	Ala	Met	Pro	Ala	Phe	Ala	Ser	Ala	Phe	Gln
	305					310					315				320
Arg	Arg	Ala	Gly	Gly	Val	Leu	Val	Ala	Ser	His	Leu	Gln	Ser	Phe	Leu
			325						330					335	
Glu	Val	Ser	Tyr	Arg	Val	Leu	Arg	His	Leu	Ala	Gln	Pro			
			340					345							

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International Bureau



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- (71) Applicants and
(72) Inventors: **FINN, Rory** [US/US]; 976 Sunburst Court, Manchester, MO 63021 (US). **GOKARN, Yatin** [US/US]; 1501 Maple Avenue, Apt. 606, Evanston, IL 60201 (US). **HILLS, Robert** [US/US]; 1620 Summers End Lane, Fenton, MO 63026 (US). **NICASTRO, Peter** [US/US]; 1904 Hurstgreen Avenue, Overland, MO 63114-5736 (US). **QI, Hong** [US/US]; 4529 Concord Lane, Northbrook, IL 60062 (US). **SEDO, Kurt** [US/US]; 4515 N. Rockwell Street, Chicago, IL 60625 (US). **SIEGEL, Ned** [US/US]; 312 N. Powder Mill Road, Belleville, IL 62223-1153 (US). **WALTER, Smith** [US/US]; 2603 Greenbuar Estates Courts, St. Louis, MO 63122 (US).
- (54) Title: **CHEMICALLY-MODIFIED MYELOPOIETIN CONJUGATES**
- (57) Abstract: The present invention provides a chemically modified Myelopoietin (MPO) prepared by binding a water soluble polymer to the protein. The chemically-modified protein according to the present invention may have a much longer lasting neutrophil-increasing activity than that of the un-modified MPO, enabling reduced dose and scheduling opportunities.
- (74) Agent: **BAUER, S., Christopher**; Corporate Patent Dept., P.O. Box 5110, Chicago, IL 60680-5110 (US).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:**
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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/11256

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61K47/48 C07K14/54 A61P7/00 A61P37/06 A61P37/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C07K A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, CHEM ABS Data, MEDLINE, EMBASE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 90 12874 A (GENETICS INSTITUTE INC.) 1 November 1990 (1990-11-01) claims 1-14	1,7-36
Y	page 13, line 20 -page 14, line 18 page 16, line 12 - line 29 ---	2-6
Y	WO 95 21197 A (G.D. SEARLE &CO.) 10 August 1995 (1995-08-10) cited in the application claims 1-13 ---	2-6
Y	US 6 022 535 A (S. C. BAUER ET AL) 8 February 2000 (2000-02-08) cited in the application claims 1-62 --- -/-	1-36



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/11256

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 96 11953 A (AMGEN INC.) 25 April 1996 (1996-04-25) claims 1-19 ---	1-36
A	WO 94 12639 A (G.D. SEARLE ET AL) 9 June 1994 (1994-06-09) claims 1-21 ---	1-36
A	FRANCIS G E ET AL: "PEGYLATION OF CYTOKINES AND OTHER THERAPEUTIC PROTEINS AND PEPTIDES: THE IMPORTANCE OF BIOLOGICAL OPTIMISATION OF COUPLING TECHNIQUES" INTERNATIONAL JOURNAL OF HEMATOLOGY, ELSEVIER SCIENCE PUBLISHERS, NL, vol. 68, no. 1, July 1998 (1998-07), pages 1-18, XP000791226 ISSN: 0925-5710 abstract ---	1-36
A	ZALIPSKY S: "FUNCTIONALIZED POLY(ETHYLENE GLYCOL) FOR PREPARATION OF BIOLOGICALLY RELEVANT CONJUGATES" BIOCONJUGATE CHEMISTRY, AMERICAN CHEMICAL SOCIETY, WASHINGTON, US, vol. 6, no. 2, 1995, pages 150-165, XP002068523 ISSN: 1043-1802 the whole document -----	1-36

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/11256

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9012874	A	01-11-1990	US 5166322 A AT 140969 T AU 5553790 A DE 69027989 D1 DE 69027989 T2 DK 469074 T3 EP 0469074 A1 EP 0668353 A1 EP 0668354 A1 ES 2090132 T3 JP 2557144 B2 JP 4504801 T WO 9012874 A2	24-11-1992 15-08-1996 16-11-1990 05-09-1996 20-02-1997 26-08-1996 05-02-1992 23-08-1995 23-08-1995 16-10-1996 27-11-1996 27-08-1992 01-11-1990
WO 9521197	A	10-08-1995	US 5738849 A AU 700220 B2 AU 1680595 A EP 0742796 A1 JP 9508524 T NZ 279624 A NZ 329952 A WO 9521197 A1 US 6132991 A US 5858347 A US 6074639 A	14-04-1998 24-12-1998 21-08-1995 20-11-1996 02-09-1997 27-05-1998 30-08-1999 10-08-1995 17-10-2000 12-01-1999 13-06-2000
US 6022535	A	08-02-2000	US 6057133 A US 5604116 A AU 697433 B2 AU 1835695 A BR 9506733 A CA 2182484 A1 CN 1227604 A CZ 9602298 A3 EP 0742826 A1 FI 963072 A NO 963225 A NZ 281421 A PL 315791 A1 WO 9521254 A1 US 6030812 A US 5817486 A US 6093395 A JP 10502801 T AU 690088 B2 AU 5612594 A EP 0672145 A1 JP 8503706 T US 6153183 A US 6051217 A US 6060047 A	02-05-2000 18-02-1997 08-10-1998 21-08-1995 23-09-1997 10-08-1995 01-09-1999 11-12-1996 20-11-1996 02-08-1996 25-09-1996 27-05-1998 09-12-1996 10-08-1995 29-02-2000 06-10-1998 25-07-2000 17-03-1998 23-04-1998 22-06-1994 20-09-1995 23-04-1996 28-11-2000 18-04-2000 09-05-2000
WO 9611953	A	25-04-1996	US 5824784 A AT 179991 T AU 706700 B2 AU 1841995 A AU 4887099 A CA 2178752 A1	20-10-1998 15-05-1999 24-06-1999 06-05-1996 11-11-1999 25-04-1996

INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/US 01/11256

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9611953 A		CN 1313343 A	19-09-2001
		CN 1139932 A ,B	08-01-1997
		DE 69509628 D1	17-06-1999
		DE 69509628 T2	16-09-1999
		DK 733067 T3	01-11-1999
		EP 0733067 A1	25-09-1996
		EP 0822199 A2	04-02-1998
		ES 2131811 T3	01-08-1999
		GR 3030526 T3	29-10-1999
		HK 1008826 A1	31-03-2000
		IL 112585 A	31-08-2000
		JP 11310600 A	09-11-1999
		JP 3177449 B2	18-06-2001
		JP 9025298 A	28-01-1997
		JP 9506116 T	17-06-1997
		JP 3177251 B2	18-06-2001
		KR 248111 B1	15-03-2000
		KR 261030 B1	15-06-2000
		NZ 281469 A	24-04-1997
		WO 9611953 A1	25-04-1996
		US 5985265 A	16-11-1999
		ZA 9501008 A	18-10-1996
WO 9412639 A	09-06-1994	AU 690088 B2	23-04-1998
		AU 5612594 A	22-06-1994
		AU 5670994 A	22-06-1994
		AU 6078398 A	18-06-1998
		CA 2150116 A1	09-06-1994
		CA 2150117 A1	09-06-1994
		EP 0672145 A1	20-09-1995
		EP 0670898 A1	13-09-1995
		JP 8503706 T	23-04-1996
		JP 8503489 T	16-04-1996
		WO 9412638 A2	09-06-1994
		WO 9412639 A2	09-06-1994
		US 5772992 A	30-06-1998
		US 5738849 A	14-04-1998
		US 6057133 A	02-05-2000
		US 6153183 A	28-11-2000
		US 5604116 A	18-02-1997
		US 5677149 A	14-10-1997
		US 6030812 A	29-02-2000
		US 6132991 A	17-10-2000
		US 5817486 A	06-10-1998
		US 6093395 A	25-07-2000
		US 6051217 A	18-04-2000
		US 5997857 A	07-12-1999
		US 5858347 A	12-01-1999
		US 6060047 A	09-05-2000
		US 5997860 A	07-12-1999
		US 6074639 A	13-06-2000